

MODERN Machine Shop

SEPTEMBER, 1944

VOL. 17, No. 4

CINCINNATI, OHIO

We Present---

— as the feature article in this month's issue — a story on the building of marine engines at the Joshua Hendy Iron Works, Sunnyvale, California. The article discusses the history and development of Hendy and the important part which this firm is now playing in the production of engines for ships required in the maintaining of simultaneous wars across two different oceans.

— on page 138 — an evaluation of the "task" method of paying for production, by Phil Carroll, Jr., author of "Time Study for Cost Control." The advantages resulting from the use of the wage incentive system in present and post-war production are fully explained in this article.

— on page 164 — "Recent Progress in High Speed Tapping" — an article by C. W. Hinman, Designing Engineer, illustrating and describing tapping machine improvements, lubricants and coolants, and special tapping fixtures and their effect in speeding up the production of tapped parts of all types.

— on page 188 — the second half of the article, "Possibilities of the Master Tooling Dock," by Leland A. Bryant, Consulting Engineer, Consolidated Vultee Aircraft Corporation. In this particular installment, the author presents the most important considerations in designing fixtures for the Master Tooling Dock.

— on page 210 — under the heading "Ideas from Readers," photographs and drawings, together with explanations, of various tools, fixtures, and devices which are designed to enable the shop worker to perform his particular duties with maximum speed, ease, and safety.

— on page 230 — announcements concerning the War Conference Displays and National Metal Congress to be held the week of October 16 in Cleveland's Public Hall; and the semi-annual meeting of the American Society of Tool Engineers to be held in Syracuse, New York, October 12, 13, and 14.

— on page 238 — the regular department devoted to illustrations and descriptions of new shop equipment and materials.



Fig. 1—Machining Frigate Engine Bedplates on Craven Planer

Marine Engines By Hendy

By HOWARD CAMPBELL

Fighting two wars at the same time—and both of them across the two oceans—calls for ships and more ships. And ships need engines. This article is the story of an engine builder who produced the engines to meet this need—the Joshua Hendy Iron Works, Sunnyvale, California

WHEN gold was discovered in California in 1848, one Joshua Hendy—a New England machinery builder—got the western “fever” and

wound up on the West Coast. There he started a mining machinery business, which gradually developed into a headquarters for everything needed

in the way of machinery, from placer mining equipment to horse-drawn fire engines.

The great San Francisco fire destroyed the original Joshua Hendy plant and a new one was built at Sunnyvale, some 35 miles from the Golden Gate. With the coming of World War I the plant was turned over to the construction of marine steam engines. When World War II broke, the present owners of the Joshua Hendy Iron Works again took on the job of supplying marine engines for the vast fleet of ships that was needed by Uncle Sam to get men and materials to the points where they could be used most successfully.

The initial order was for 12 Liberty ship engines of the reciprocating type. Other orders were added until several hundred had been constructed for use by the government. More recently the building program has been shifted from Liberty reciprocating engines to the Victory turbine engines. This article presents a number of views and descriptions of the various operations and pieces of equipment involved in the machining of parts and building of these engines.

The illustration Fig. 1 shows the operation of finishing the surfaces of frigate engine bedplates, which is done by planing them in the British-made Craven planer. This planer is

Fig. 2—Sixteen Link Bars for Liberty Ship Engines are Machined in One Setting on this 17-Foot Cincinnati Planer



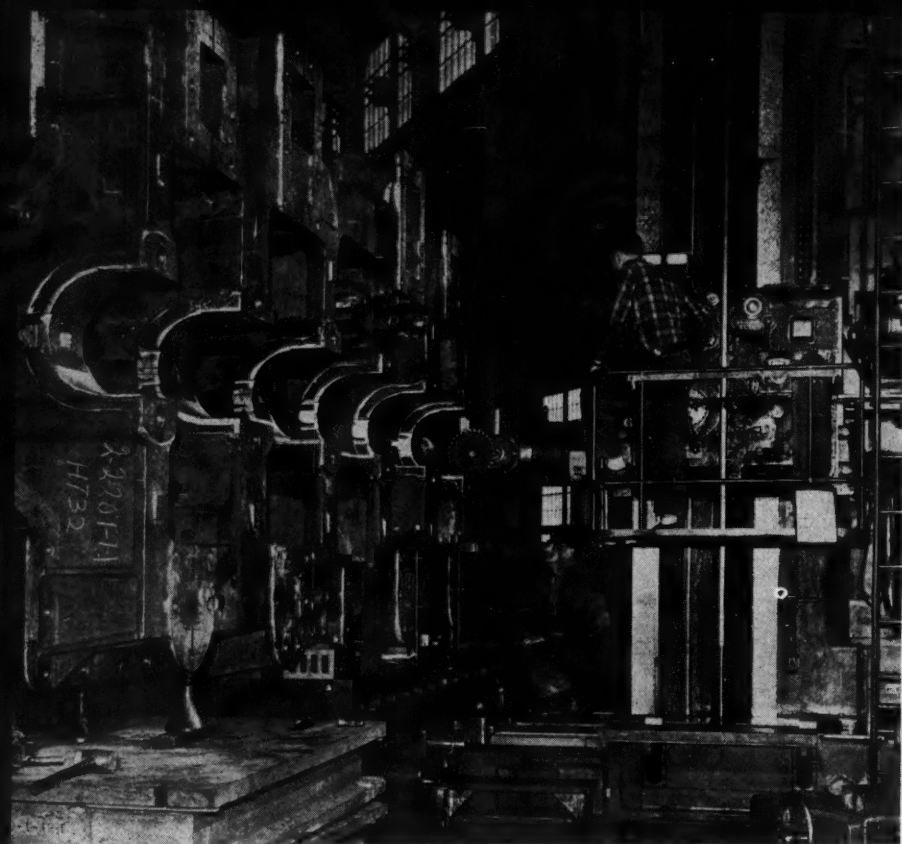


Fig. 3—Machining Main Bearings for Crankshaft in Vickers Engine Bedplate. The Machine is a Giddings & Lewis Horizontal Boring Machine

one of two of the same size in the Hendy plant, and these are believed to be the largest planers in the world.

The Craven planer is 24 feet high overall, the bed is 60 feet long, and the table is 15 feet wide by 33 feet long. The machine has a capacity of 13 feet between the table and crossrail and the crossrail is 30 feet long. The table is driven by two 75 h. p. motors, a $12\frac{1}{2}$ h. p. motor being used to control the crossrail. Eight motors are required for the operation of the machine itself, plus a 175 h. p. motor which turns three generators

to provide the power for the unit.

The picture indicated as Fig. 2 was taken from overhead, looking down on the circular table of a huge Cincinnati boring mill. The operation is the forming of the inside and outside radii on the link bars for the Stevenson linkage of the reversing mechanism used in Liberty ship engines. Sixteen bars are machined simultaneously on the 17-foot table, the cutting being done by two $\frac{3}{4}$ -inch square high speed steel tools, one mounted in front of each column. What looks like partitions set up around the cir-

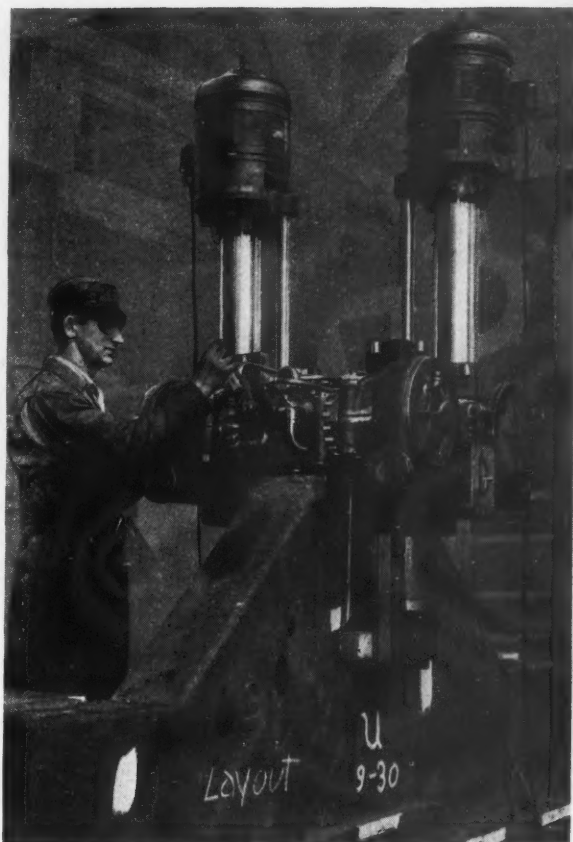
Fig. 4—Using a Hendy-Designed Portable Milling Machine to Face Bedplate Cheeks. With this Machine the Job is Done in Nine Hours

cular table, inside the work ring, are braces anchored there to strengthen the table and to prevent sag or torsional distortions which might interfere with precise machining.

The operation shown in process in Fig. 3 is the milling of the cheeks of the main bearing jaws of Vickers engine bedplates. All right-hand cheeks were milled individually, then the casting was reversed and the left-hand cheeks were milled, using a Giddings & Lewis horizontal milling machine equipped with a right angle attachment for a 12-inch cutter.

The bedplate weighs 20,250 pounds and for this operation is held in place by the use of big angle plates with straps clamps. This bedplate forms the foundation of the 78-ton, 2750 h.p. Vickers engine used in pairs to power coastal patrol frigates.

The illustration Fig. 4 shows the same operation of milling bedplate cheeks that was shown in Fig. 3, excepting that in this case the operation is being performed with a special Hendy-designed machine that is located and clamped to main bearing saddle. With this machine four cheeks are milled simultaneously and absolutely square to gage dimensions, the entire job being done in 9 hours in-



stead of the 15 formerly required.

The portable machine shown in use here is dropped by crane into the saddle of the bearing, where it is fastened in place by bolting through the bearing hold-down bolt holes in the bearing cap. The milling operation is performed with four 8-inch inserted tooth cutters with Stellite teeth. Power is supplied by two 5 h. p. motors mounted at the upper ends of fixtures which are just long enough to permit them to clear the top of the bedplate when the cutters are operating at the bottom. The average tolerance on this operation

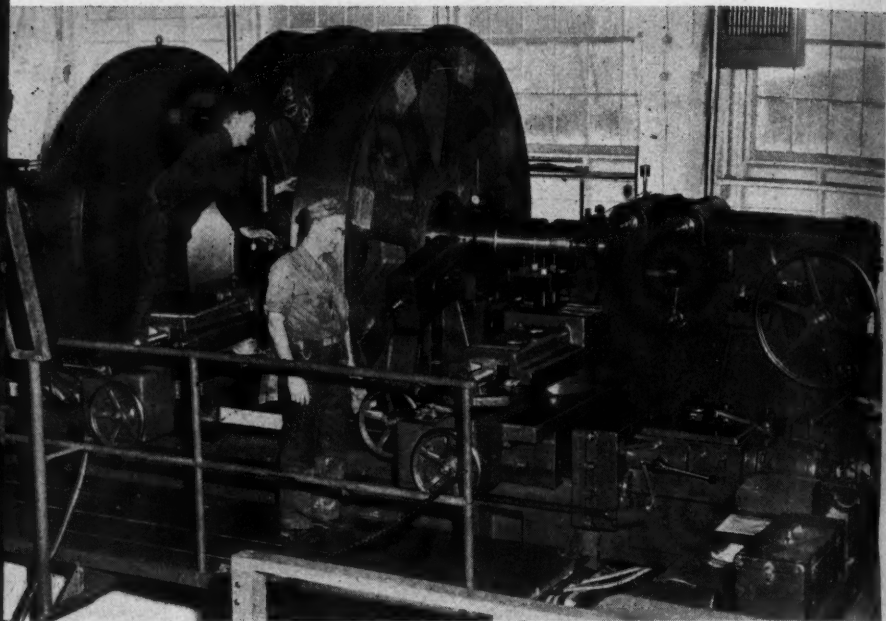


Fig. 5—Turning Gears for Reducing Speed from 6,000 R.P.M. at the Turbine to 90 R.P.M. at the Propeller. The Allowance on the Diameter is 0.001 Inch

is 0.10-inch. In this illustration the operator is shown manipulating the hydraulic feed of the fixture.

The operation of turning a pair of turbine bull gears that are used in Victory ship engines is shown in process in Fig. 5, a Fitchburg lathe being used for this operation. These two gears, with others in the train, reduce the speed from 6,000 r. p. m. at the turbine to 90 r. p. m. at the propeller. The largest gears at present handled in this lathe are 12 feet 3 inches in diameter, each with an 18 $\frac{3}{4}$ -inch face, and weighing 7 $\frac{1}{2}$ tons. The complete assembly of two gears and their shaft weighs approximately 24 tons.

The gears are made from heavy steel plate and are of welded construction. Vents are cut in the center-plates of the wheels with cutting

torches, then the center-plates are welded, with a heavy fillet, to the rims and hubs. Internal web plates separate the center-plates and make the structure rigid. Some 80 feet of the external welding by which the center-plates are joined to the rims and hubs is performed by Union-melt machines, while the gear is held and revolved by a huge gear positioning machine. For the remaining 75 per cent of the welding, the whole gear is heated to 450 deg. before work begins, so that stresses will be kept at a minimum. When complete, the gear is stress-relieved in a big annealing oven.

The shaft is slightly tapered, as are the inner surfaces of the hubs (whose diameters are from 0.012 to 0.015 inch smaller than their seats on the shaft) permitting each gear

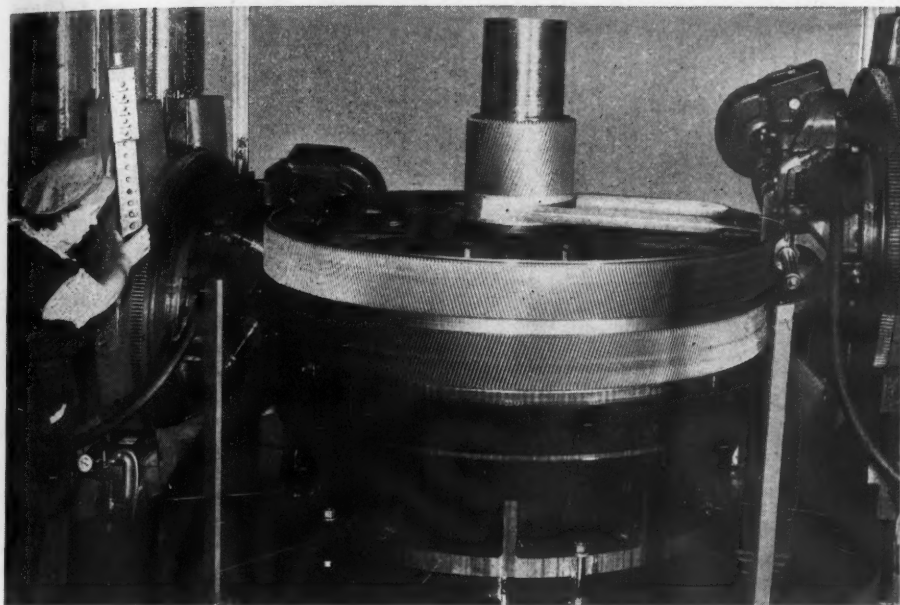


Fig. 6—The Operation of Cutting the Teeth on the Huge Reduction Gear is Performed in an Air-Conditioned Room. A Double Hobbing Machine Cuts the Time in Half. Tolerance, 0.0002 Inch

to be shrunk into place in turn. Fixed keys on the shaft further assure permanence and accuracy of seating. With the gears and shaft thus anchored, the unit is swung into the lathe shown in Fig. 5 and the O. D. is turned and faced to size. The tolerance limit on this operation is 0.001 inch.

The teeth are cut on the huge reduction gear in a room that is air-conditioned and maintained at a 68 deg. temperature—so that the finest possible accuracy may be obtained on these gear teeth. This operation, shown in Fig. 6, is performed on a Gould & Eberhardt double hobbing machine, the double machine being intended to cut the hobbing time in half of that which would be required for this operation on a single machine. The maximum tolerance on all

dimensions is 0.0002 inch, the measurements being taken with micrometers and other measuring instruments which are kept in an adjoining laboratory which is also maintained at 68 deg. Fahrenheit.

The hob used on the largest gears is eight inches in diameter and cuts to a depth of 0.385 inches. When started, the cutting operation is not stopped until completed. The machines are anchored on massive concrete foundations which are so constructed that the machines are insulated against shock.

All turbine reduction gears are subjected to an X-ray test before they are released for service. The portable X-ray machine built for this service, shown in Fig. 7, was designed and built under the direction of Stanley Lynn, director of the Hendy de-

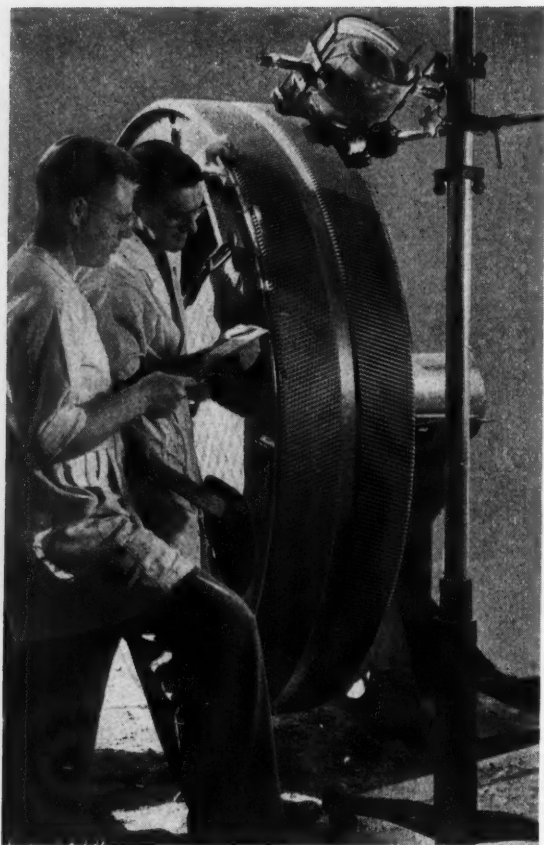


Fig. 7 — All Turbine Reduction Gears are Radiographed with this Hendy-Built Portable X-Ray Machine Before Being Released for Installation

the tail sections of these shafts. These tubular liners are each 12 feet 8½ inches long and are 19½ inches in diameter, with 1 1/32 inch wall. They cost around \$2500 each, and if improperly set, they cannot be salvaged.

In order to set the bronze liner onto the tail section of the shaft and shrink it into place under the method generally in use, the liner is heated with blow torches until it has expanded sufficiently to be slipped over the shaft, where it is properly positioned and permitted to cool and shrink onto the shaft. This process usually takes from four to six hours and frequently, after the shaft has been inserted, the cooling is so

uneven that the liner freezes in the wrong position on the shaft and must be removed—which can only be done by cutting the liner from the shaft with a loss of valuable material and an additional loss in time and money. In comparison, the Hendy process takes only from 1½ to 1¾ hours from start to finish and freezing of the liner in its position is assured.

The principal feature of the Hendy process is that the liner is heated throughout in one operation, with perfect uniformity. A vertical heating chamber, designed to accommodate the entire 19-foot 4 1/8-inch length

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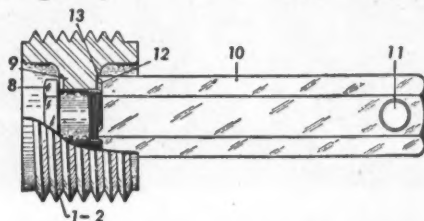


You and your employees may care to familiarize yourselves with gage terminology and construction. This is the first of a series presenting details on our various thread plugs, thread rings, plain plugs, plain rings and special gages.

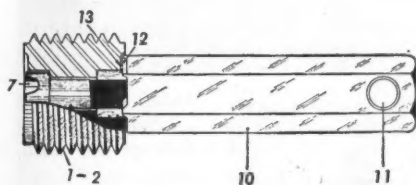
Standard Design of Thread Plug Gages



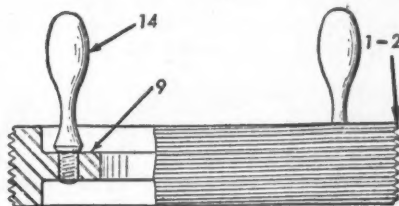
Range: No. 0 to and including 1.510 inches



Range: Above 2.510 to and including 8.010 inches



Range: Above 1.510 to and including 2.510 inches



Range: Above 8.010 to and including 12.010 inches

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|---------------------------|---|
| 1. "Go" gaging member | 8. Hexagon head screw |
| 2. "Not go" gaging member | 9. Web |
| 4. Shank | 10. Handle for reversible or trilock gage |
| 5. Taper lock handle | 11. Cross pin hole |
| 6. Drift hole or slot | 12. Locking prong |
| 7. Socket head screw | 13. Locking groove |
| | 14. Ball handle |

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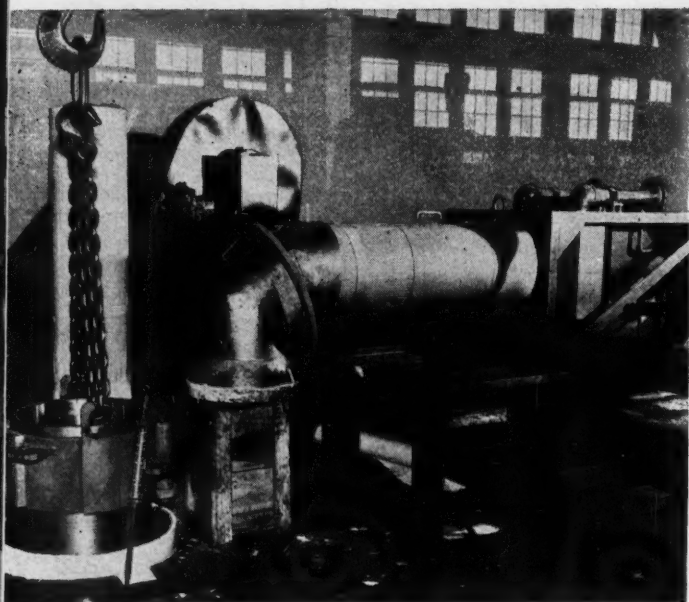


Fig. 8—Bronze Tail-Shaft Liners are Expanded by Heating in a Vertical, Electrically-Heated Chamber

of the shaft was built and sunk vertically in the floor so that the top end of the chamber was even with the floor level. This chamber is metal-lined and insulated.

level, is connected with the chamber so that super-heated air will be directed through the interior of the cylinder. A check is maintained on the temperature by means of three thermometers located at the top, center, and bottom of the chamber.

When previously-set micrometers positioned at the top of the liner show that it has been expanded sufficiently, the upper furnace is disconnected.

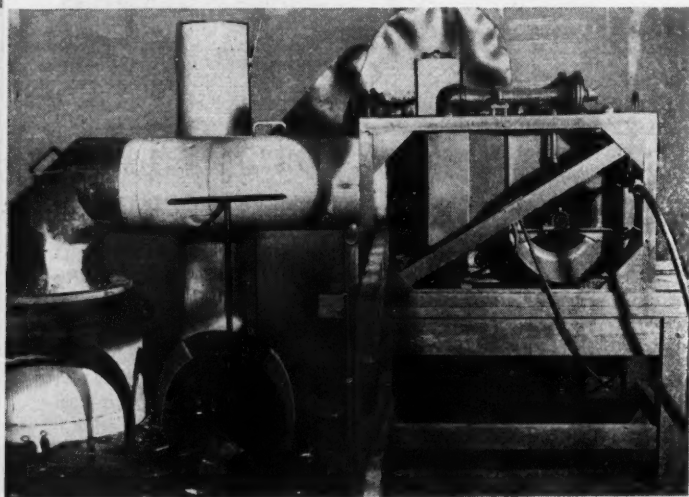


Fig. 9—The Interior of the Liner is Heated by Means of a Portable Electric Hot-Air Furnace

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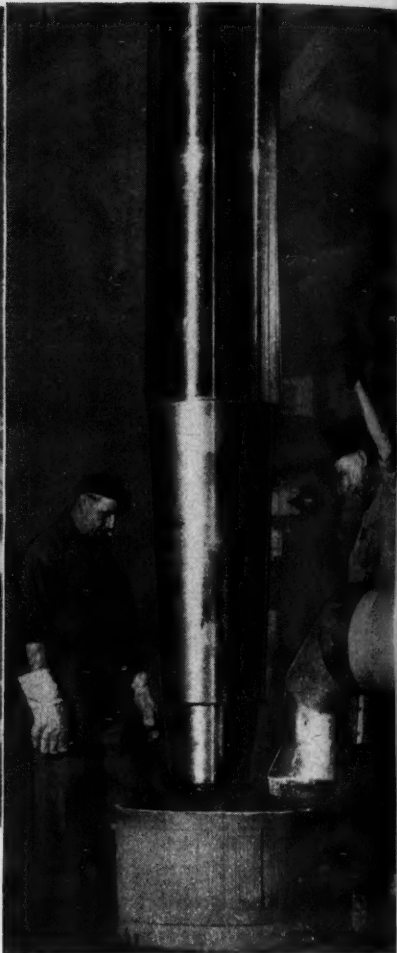
HERE'S a Super-Service Radial at the plant of American Machine and Metals, Inc., in Illinois, being used to bore, drill and tap holes up to 4.173" diameter on a gun, mount pedestal casing approximately 4' high by 3' across base. Tapping involves 22 holes of various sizes. Limit of accuracy is .001. While production figures are not available for publication, we can say with assurance that the floor-to-floor time is exceedingly low. Summed up in the words of the operator "This machine handles easily—does a good job." Such commendation typifies the kind of report we receive from operators everywhere to speak from actual experience with Super-Service Radials.

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Fig. 10 (Left)—With Liner in Place, Shaft is Removed from Heating Chamber. Fig. 11 (Right)—Completed Shaft Is Lifted Clear of Chamber and Removed for Machining



nected and lowered away on its track while the lower furnace continues to heat the outer surface, keeping the expansion of the tube at a constant point. The cold shaft, equipped with a special spacer to ensure correct position of the liner, is then lowered into place and the lower furnace is shut off.

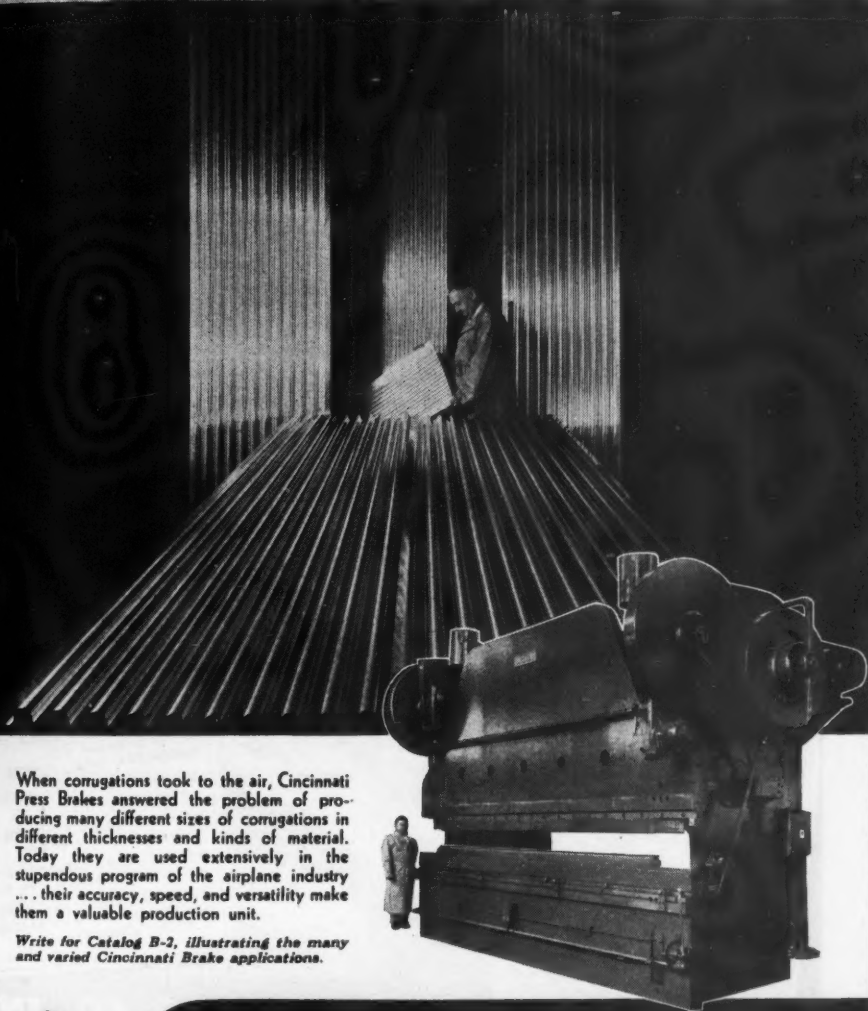
Since the installation has permitted perfect control of temperatures, the

liner has been expanded to the minimum necessary for the easy insertion of the shaft. The shrinking process is quick and uniform, with no chance of distortion or premature freezing. All handling is done by crane with special clamp to hold the liner and shaft, thus adding a safety factor not present in previous methods.

(Continued in October Issue)



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Wage Incentive--Now and Post-War

An evaluation of the "task" method of paying for production

By PHIL CARROLL, JR.

Author, "Time Study for Cost Control."

SINCE John W. Nickerson, Director of the War Production Board's Management Consultant Division, made the statement before the American Foundrymen's Association that wage incentive plans are accounting for an average increase in productive performance of 25 to 40 per cent in regions where they have been adopted, it would seem that practically everyone interested in war production has become interested in this subject.

Those whose task it is to get equipment to the Armed Forces are urging its use to help increase production and also to bring about a better utilization of manpower. Those who turn out the work are asking that incentives be installed so as to provide opportunities for increasing their "take home." Those on the sidelines in Washington see in it a possible solution to the multiple problem of production, wages and stabilized costs.

May we hope that the latter's interests may be interpreted as a sign of changed thinking that will lead to the repeal of the insult to the taxpayers which prohibits the use of anything resembling timetudy in connection with Army, Navy and Post Office Appropriations. (Public Act No. 441, 77th Congress.)

In addition to whatever desires we, as individuals, may have to the end of speeding the war to a successful conclusion, all of us are interested in "incentives" right now because of the important bearing they can have on helping to hold down the amount of the bill for the war—which we are going to have to pay. And it is gratifying to be able to report that some of the people concerned are beginning to look at costs, and what they consist of.

Fallacy of the Straight Day Rate

The time-honored method of paying a worker for his services over a period of time—hour, day, week or month—is as inefficient as it is old; inefficient, because the value received for the wage is uncertain and unpredictable; inefficient, because the amount of production depends upon the strength, ability, and honesty of the worker; inefficient, because of the impossibility of establishing costs under such a system.

Practically everything that is purchased in the market, including the product of the day worker's labor, is paid for on the unit basis; the only item that is exempt from this definite and unquestionably fair and equitable method of trading is the labor of the

day-worker. The employer buys his raw materials on a unit basis; he sells his finished product by the unit. All the necessities of life are purchased by the unit; it only remains to pay the laborer for his production by the unit to complete the cycle.

Payment for labor on a straight day-work basis makes no provision for rewarding the individual according to his ability to increase his output. Earnings are restricted to a narrow range of base rates for the class of operation upon which the worker is employed. Thus the worker's earnings are restricted to a given amount per hour regardless of his superior skill or exceptional ability to produce, and leads restriction of output to the pace set by the slowest or least able workman.

One step forward is taken when, as in piece-work, a given rate per operation is established. Then both the producer and the company have something to go on that is not one-sided. Fair or unfair, at least there are two sides to the wage contract—a stated amount of pay for a specific amount of output.

Piece-Work

But piece-work fails to offer a sound basis for a good incentive system for three reasons. First; the incentive rates are expressed in terms of cash. These terms combine the base rate and the time allowance, if

any consideration is actually given to the latter. The result is that no correct basis is readily available for such other important uses of incentive as production planning, delivery scheduling, budgeting, and overhead distribution. These factors necessitate a time measure of performance and output. In contrast, dollars do not constitute a reliable gauge because of the several different base rates involved in any money reporting of output.

Second; piece-work prices are unsatisfactory for use with good wage incentive because they are subject to change with every fluctuation in the wage level. A corresponding adjustment would appear to be a simple matter of arithmetic, but such is not usually the case. The fact is that wage change, particularly in the case of increase, is gradual and often affects only the current work. Subsequently other piece rates are changed and inconsistencies are created. These gradual changes, and the compromised manner in which most of them are made, bring about many inequities, except in the rare instances where all rates are changed at the same time.

Third; piece-work is often handled in such manner as to be unfair to both management and labor. As a consequence it is inequitable as an incentive in the true sense. This

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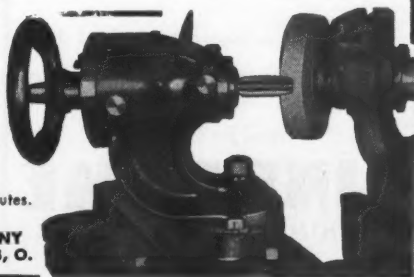
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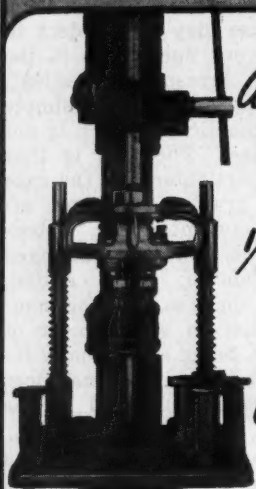
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point of view may be illustrated by the following typical statements which stem from "piece-work" thinking:

a. "The man gets paid only for what he does."

b. "Operators will take things easy if you guarantee base rates."

3. "We shouldn't pay for delays of less than 15 minutes."

The short-sighted attitude which makes for unfairness to the operators is like "straining at a gnat and swallowing a camel." The piece-work advocate says, "I know what my costs are going to be." He does, so far as labor cost is concerned, yet his overhead may be high because that goes on just the same during the periods for which he thinks he saves money by not paying his workers when they are held up on the job for one reason or another. Paying for delays does introduce a variable into costs, but only to the extent that such interruptions are uncontrolled. And the greater the control exercised, the higher will be the incentive earnings and the lower the total cost.

Past Performance

Discussing a money base in favor of time standards, other considerations arise. Some of these should be taken into account, were piece-work to be used. However, they are discussed here because most of the plans being installed nowadays are set up on a "time" basis.

Assuming the use of the more practical time basis, the first thing to remember is that incentive is not a simple cure-all. The numerous major elements bearing on successful operation are typified somewhat by that oft-repeated phrase, "It isn't the first cost but the upkeep that counts." An example is that of the youngster who finds a great bargain in a \$25 automobile (his first), only to learn

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"Ordnance hospital" scene somewhere near the fighting front . . .
"operating" on an injured machine-gun. U. S. Army Signal Corps photo.

IN ORDNANCE WORK, where field repairs are varied and numerous, thousands of army-trained mechanics are having plenty of opportunity for making file comparisons. These are sure to influence their preferences when they return to the peacetime industrial work-benches.

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U.S.A.
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that his license, insurance, oil consumption and maintenance costs far exceed his calculations.

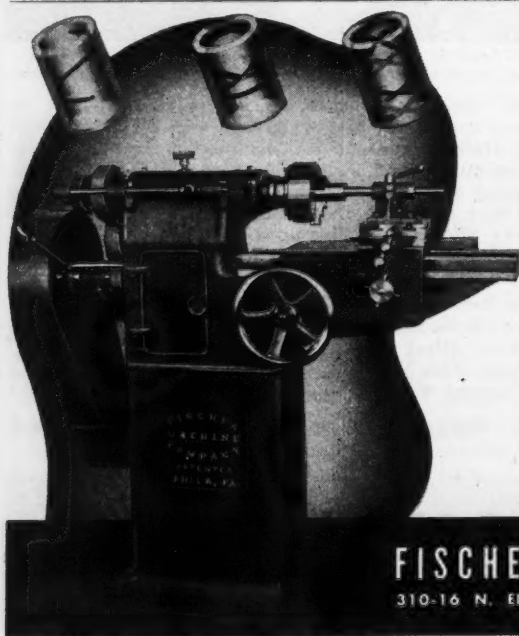
In a similar way, incentive without correct measurement will bring on many headaches. These are predestined when incentive is set up on a trial-and-error base, and that is the method used when past performances are taken as the starting point. To use such a basis is to revert to the very same "guesstimated" gauging of work output that brought on those scourges, "rate cutting" and "production restricting," which are now cited as disadvantages by those opposed to incentives.

Past performances as a basis for incentive are faulty because they include time lost in waiting and in indirect effort plus all the variations resulting from excess manpower, scrap pieces, and turnover. Such losses are inevitable, especially in the vastly expanded industrial activity brought

on by the war. Some part of each of these losses occurs even in the best of well-managed firms. The point is not that we can expect to operate under "ideal conditions"; rather, it is an attempt to emphasize the fact that incentive should reward for **improvements in efficiency**, not for the elimination of inefficiencies.

Low Production

Looking at effect instead of cause, we may attribute a substandard rate of production to a lack of interest on the part of the operator. In places that may be true, and incentive will go a long way toward gaining his interest and the increase in output resulting therefrom. Moreover, incentive will probably induce him to complain about the interferences just mentioned, because they hold down the amount of his "take home." But he cannot eliminate the holdups which are beyond his control. For



FISCHER *Oil Groovers*

A wide variety of grooves may be cut on the "FISCHER" . . . with minimum set-up time and cost.

Bearing in which groove is to be cut is mounted on revolving chuck secured on work spindle. Boring tool is secured to carriage slide which has a reciprocating motion timed with work spindle and lined by crank gear and connecting rod.

Several attachments can be furnished for cutting practically any type of oil groove.

Capacity of No. 1 Machine—5" dia. . . . No. 2 Machine—15" dia.

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PHILADELPHIA, PA.

American's Complete Broaching Service

Solving Production Problems of War

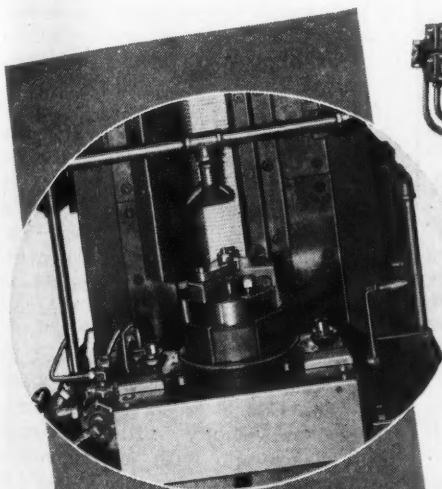
... Ready to Plan for Peace

The advantages of broaching by American are well known to the Nation's leading manufacturers. Almost every war industry has made use of broaching, the American way, to secure fast, accurate, economical output.

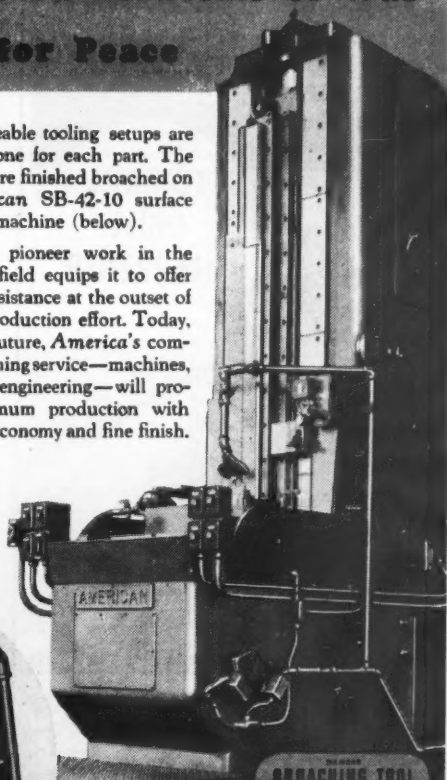
For example, in the production of a new aircraft part, one operation entails the finishing of a two-part stopsleeve. An American SB-66-15 surface broaching machine (right) rough broaches radii between the lugs, sides of the lugs, and flat across the index of the lugs. Two

interchangeable tooling setups are provided, one for each part. The parts then are finished broached on an American SB-42-10 surface broaching machine (below).

America's pioneer work in the broaching field equips it to offer valuable assistance at the outset of any new production effort. Today, and in the future, America's complete broaching service—machines, tools, and engineering—will provide maximum production with maximum economy and fine finish.



For longer branch life
keep broaches sharp



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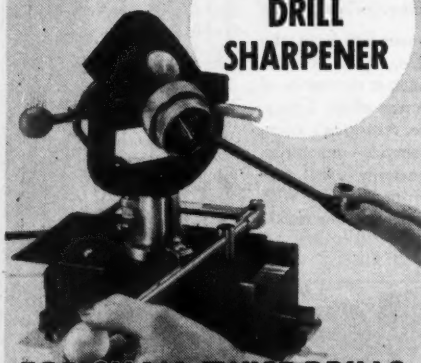
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JUST 20 SECONDS!

IT'S NEW! IT'S FAST!
IT'S ACCURATE!

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With 10 Bushings

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423 EUCLID AVENUE
CLEVELAND 14, OHIO

that reason, he should not be rewarded through increased earnings for the time saved through reductions of "management errors." That is a very important point which must be understood before any discussion of method can have meaning.

The foregoing is exceedingly important because of its direct effect upon the total result. This is emphasized by the wide variance in the figures which have been quoted to indicate possible increases in production through the use of incentive. These range all the way from 10 per cent to 300 per cent. The degree of improvement, of course, depends on many factors. Three major ones are:

1. The conditions at the start.
2. The attitude toward incentive.
3. The vision of management.

If the shop is one that was "thrown together" years ago and has "grown up" unaided by training in better management methods, the possibilities for improvement may be unbelievably large.

However, in the last analysis, much of the success of an incentive plan is determined by the attitude in the departments affected. If the employees see the advantages to be gained, a practical plan will be a success. Consequently, the attitude toward incentive is a very important factor to remember when discussing percentages of improvement.

Further, attitude is influenced by what management says and does. But point No. 3 is set apart to emphasize a wholly different angle. That has to do with management's willingness to "face the music" in such matters as are typified by "delays beyond the control of the operator." That detail may seem insignificant. And it is, if taken literally. The attitudes involved are contrasted by the differences in outlook

For Tool Room Bosses Who See Red

Let BLUE FLASH Tool and Cutter Wheels help lighten your load and pick up the time lags with their

1. **Cooler cutting** ... Bay State's H9 vitrified bond is so tenacious that less is needed to hold the abrasive grains ... a feature that helps wheels cut better ... last longer.
2. **Cleaner and faster cutting** ... Blue Flash wheels have special abrasives designed for various tool room grinding purposes. The most generally used is Bay State's "AAA" resulting in a pure white product. For production and duplicate parts grinding, both A6 and AA2 abrasives give outstanding performance — these products are blue in color.

Bay State makes a complete line of tool room grinding wheels for every purpose ...

for cemented carbides, for tool salvage, notching, fine finishing, small surface grinding, and general cutting-off.

Where extra coolness and fast cutting is vital, Bay State's KOOLPORE wheels, with their very open porosity, are getting the call in many shops.

Bay State offers the broadest line, the most practical features; fractional grades ... controlled porosity; the finest honing and finishing stones made; expert engineering assistance to help you get the most from grinding — "fit the grit to the grind".

Write for additional details and tables on Blue Flash Tool and Cutter Wheels. Ask for bulletin F.

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BLUE FLASH

GRINDING WHEELS

EAST and COOL



GRINDING WHEELS

HONING AND SUPERFINISHING STONES

PORTABLE SNAGGING WHEELS



TOOL POINTS



CUT-OFF WHEELS



INSERTED-NUT DISCS



AND CYLINDERS



September, 1944

MODERN MACHINE SHOP

145

toward simple incentive exemplified by "piece-work" on the one hand, and the more far-sighted "incentive control" plans, on the other.

Much of the inefficiency disclosed by a good incentive-control plan results from "errors of management"—insufficient planning, training, instruction—all lumped together in the term "poor supervision." Many of the difficulties are not the fault of the foreman at all. He may be unable to do anything to correct them. Management has to help, but it, like the supervisor, does not always understand how to correct the causes of inefficiency. Oftentimes, neither is aware of the extent to which these "management errors" inflate the cost and hold down production. In the absence of facts, some are inclined to assume that the interferences are "common colds" that have to be put up with.

The extent to which management

appreciates the utilization of lost and waste time is an important factor in the results to be obtained through the operation of good incentive. Not only will a high per cent of time utilization normally bring about a large increase in output, but also it will noticeably improve important business elements like overhead cost, delivery time, and inventory turnover. For such reasons, it is important thoroughly to consider the more important cost of "upkeep" and not hastily go in for bargain-counter incentives which later will prove better to have never been started.

Getting the Facts

Perhaps it was because he wanted to "separate the wheat from the chaff" that Fred W. Taylor urged timestudy men to perfect working conditions before setting the standard time on the job. Whatever was done to improve conditions beforehand was

MEASURING A PLUG GAGE with LIGHT WAVES

using an optical flat, a toolmaker's flat and a gage block

The formula is:

$$D = h + \frac{(.000012 \times N \times W)}{W}$$

Substitute the actual values

$$D = .750 + \frac{(.000012 \times 3\frac{1}{2} \times 1\frac{7}{8})}{\frac{32}{32}}$$

and get the answer

$$D = .750168 \text{ inch.}$$

It's just that simple!

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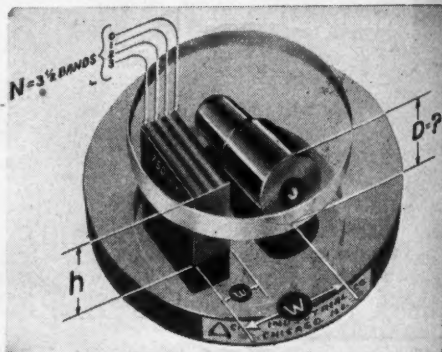
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MONroe 4122



ONE OIL CHANGE
and this "chaser" tapped
10 TIMES
AS MANY SHELLS!



SUNICUT

permits 21,600 more pieces per chaser

Twenty-four thousand shells instead of twenty-four hundred per chaser life! A big saving in tool setter's time . . . a big increase in output per machine tool. All because a large manufacturer of high explosive shells changed the cutting lubricant on a tapping operation to Sunicut, the transparent, sulphurized cutting oil developed by Sun Oil Engineers.

Greater production demands required that they tap more shells per chaser grind . . . more shells per chaser life. So they asked Sun Cutting Oil Engineers how it could be done. Sunicut was the answer . . . the proof is in the results.

With Sunicut . . . output increased from the old rate of 600 pieces, to 4300 pieces per chaser grind . . . and from 2400 pieces, to 24,000 pieces per chaser life. In addition, finish was improved.

Sunicut's advantages are extremely high heat-absorbing and metal-wetting ability, and clearer work visibility. These make possible longer tool life, greater speeds, finer finish, and increased operator interest. Find out what Sunicut can do in your own plant . . . under your own operating conditions. Consult a Sun Cutting Oil Engineer, today. Write

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HELPING INDUSTRY HELP AMERICA

certainly instituted by management. The losses were excluded from the time allowed. Consequently the gains^s in production afterward were truly the results of incentive, plus improvements in skill and ingenuity developed by the worker.

"That Takes Too Long"

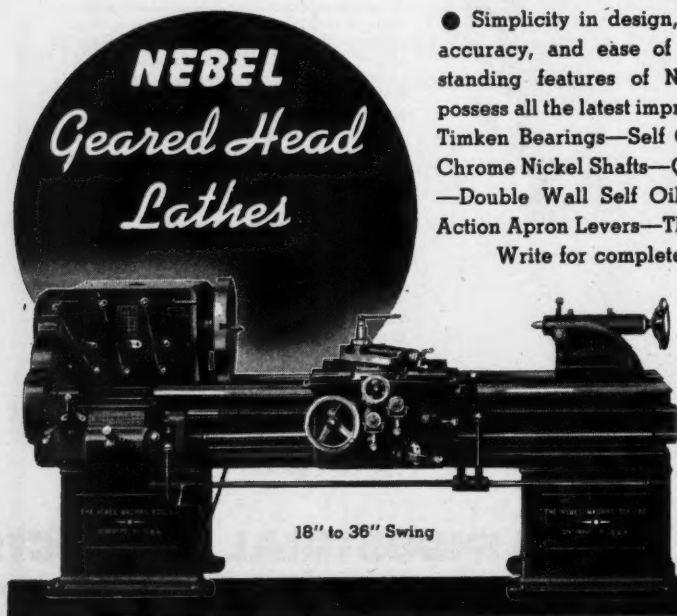
In many cases, however, it quickly becomes obvious that if the application of an incentive is to be delayed until ideal working conditions have been obtained, much of the benefit will be lost. If a delay in the setting up of perfect working conditions is anticipated, a temporary incentive should be applied. Any "ideal set of conditions" that may be set up today will be obsoleted by the developments of tomorrow.

But even if all variables could be eliminated, there are other good reasons for not following the timestudy practice so universally advocated. In

the first place, both management and labor get tired of waiting for results which seemingly never come because the "one best method" is just beyond the grasp of the timestudy man. All during this corrective stage the advantages of increased production and earnings are lost to those most interested. Again; the very attitude which urges the ideal set-up is so apt to make everyone so satisfied with things as they are, once a goal has been attained, that they become oblivious to opportunities for further progress. Often the result is that the "ideal set-up" is preserved for years after better methods have been developed by others.

Standard Data

Work done on lathes, boring mills, and other machine shop tools consists of groups of elements, some of which occur in almost every job. The same is true of all types of work. All but



● Simplicity in design, rigid construction, accuracy, and ease of operation are outstanding features of Nebel Lathes. They possess all the latest improvements including Timken Bearings—Self Oiling Headstock—Chrome Nickel Shafts—Quick Change Gear—Double Wall Self Oiling Apron—Quick Action Apron Levers—Thread Chasing Dial.

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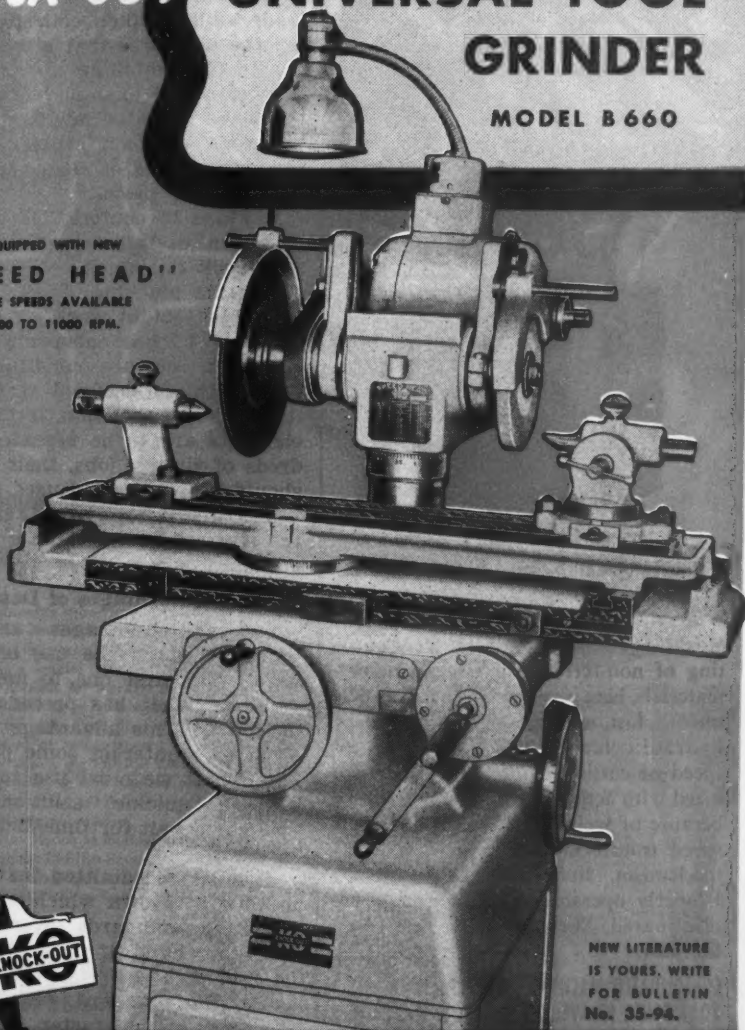
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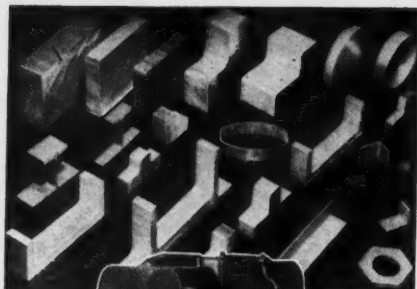
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EQUIPPED WITH NEW
"SPEED HEAD"
NINE SPEEDS AVAILABLE
1000 TO 11000 RPM.



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COMET
AUTOMATIC CUT-OFF MACHINE
MODEL MH

a few of the basic elements occur more or less frequently in the majority of operations involved in any one type of work. These elements are the detailed movements used in a trade skill. Taken collectively, they are the evidences that become apparent to one watching a "lathe hand" at work, for example. Continuing, the lathe operator might start every job done between centers with the following series of elements:

1. Pick up piece.
2. Place in centers.
3. Run in tail center.
4. Lock tail stock.
5. Start machine.
6. Run tool to work.

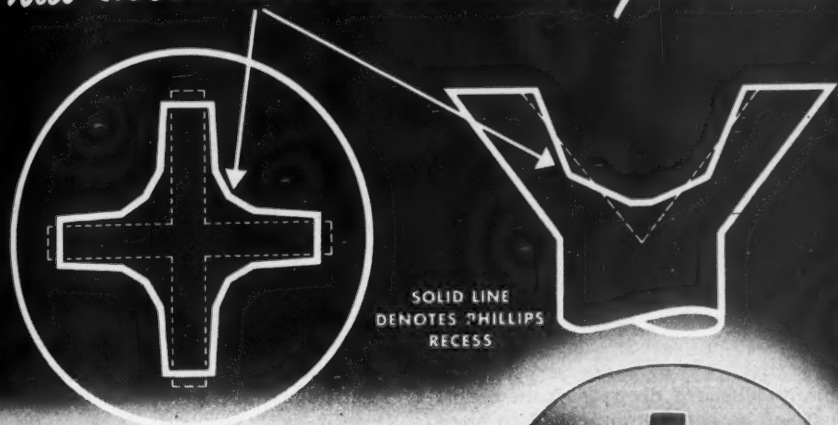
Some of these elements are constant for certain conditions; some vary with dimensional factors. But it seems obvious that if these same elements are to be repeated in hundreds of similar jobs, their standards should be set up and used instead of timing every job. When that is done, the element standards are known as standard data.

Advantages of Data

Several advantages are to be gained through the use of standard data. The first one to mention, because of what has preceded, is that of **speed**. This advantage is emphasized to counteract some part of the claim that we must use some of the current "quickie" solutions because "we can't wait for timestudy—we are in a war."

It must be admitted that no sound method is known which will produce incentive standards overnight. On the other hand, if timestudies are to be taken as the basis, then in most cases, the standard data method is the very much faster way to get maximum coverage. Moreover, the standards will be more consistent in the opportunity provided to increase earnings.

ONLY ONE *Recessed Head Screw* has these 2 Trouble-Saving Features...



It's PHILLIPS...the Engineered Recess

The left-hand drawing shows how scientifically the center corners of the Phillips Recess are *engineered*. Instead of being squared, these corners are *rounded* in a series of flat planes, with every angle and every dimension making a definite contribution to driving efficiency.

This makes it possible for workers to utilize full turning power—without danger of burring or reaming out the heads of Phillips Screws.

Now examine the right-hand drawing. This shows *more* scientific engineering. Instead of being tapered to a sharp point that would weaken the screw shank, the Phillips Recess has a nearly flat bottom.

This makes it possible to set screws up uniformly tight without fear of screw heads shearing off. The flat bottom also permitted design of a stronger, longer-lasting driver point.

Only the Phillips Recess is engineered this way. Only when you specify screws with the Phillips Recessed Head can you get the freedom from trouble... the strength and driving speed these features make possible. You can get Phillips Recessed Head Screws in any head style, type, or size.



PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS MACHINE SCREWS SELF TAPPING SCREWS STOVE BOLTS

23 SOURCES

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The Bolster Co., Watertown, Conn.

Corral Screw Co., Chicago, Ill.

Chandler Products Corp., Cleveland, Ohio

Continental Screw Co., New Bedford, Mass.

The Corbin Screw Corp., New Britain, Conn.

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The National Screw & Mfg. Co., Cleveland, Ohio

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Faster Starting: Driver point automatically centers in the Phillips Recess... fits snugly. Fumbling, wobbly starts, slant driving are eliminated. Work is made trouble-proof for inexperienced hands.

Faster Driving: Spiral and power driving are made practical. Driver won't slip from recess to spoil material or injure worker. (Average time saving is 50%.)

easier Driving: Able to utilize their full turning power, workers can maintain speed without tiring.



Besides, it takes only half an eye to see that the standard data method provides perhaps the only practical way of measuring jobbing, maintenance, and many indirect operations. It is unfortunate that more timestudy men did not adopt long ago this practice of making their studies work for them over and over again. Many more indirect operations would have been on incentive long before now.

The greater economy of the standard data method enables a Standards Department to cover a much more extensive area. It can measure consistently many types of work that cannot be covered by direct timestudy. For instance; one-piece orders would be finished before a timestudy could be completed. Moreover, when the cost of timestudy is excessive, many jobs are dropped from consideration as being impractical to measure by the timestudy method.

Cost Comparison

Rightly, management calls a halt when judgment indicates that the type of work to be measured would require one timestudy man for every producer. That would be uneconomical. Yet, many of these same operations can be put on incentive at a moderate cost. It has been demonstrated by check comparison that about seven times as many standards can be set per day from data as by direct timestudy.

Data standards can be set for short runs before work begins and thus provide incentive in job shops and foundries. That is exceedingly important from the standpoint of correct pricing. This method is constructive, further, in that it permits the measurement of many relatively small departments which are often classed as "overhead" because there is no economical way to obtain the



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Just as Lapointe pioneered in the designing of broaches and broaching machines for the mass production of precision parts . . . so too, will Lapointe continue in its quest to make better things for a better world . . . quicker and cheaper!



Earliest use of broaching principle on this continent was by soldiers of the Revolution, who drove steel balls through heated rifle barrels to give the correct bore.

The **LAPOINTE**

Machine Tool Company

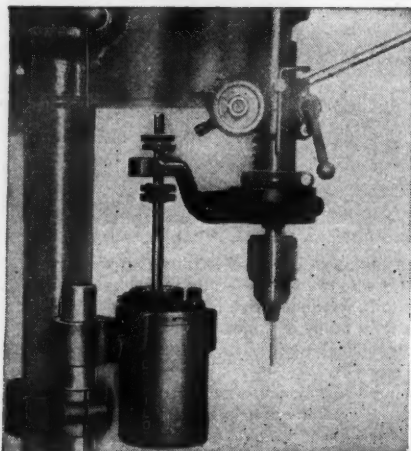
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DESIGNERS OF BROACHES AND BROACHING MACHINES

**"Have Not Lost a
Drill in 3 weeks"**

Reports one large
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COPILOT DRILL PRESS FEED REGULATOR



Enables totally inexperienced and unskilled operators to produce good work from the start . . .

Prevents violent contact of drill with work at start of operation.

. . . permits maximum production . . .
eliminates unnecessary drill breakage
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Find out for yourself the **ACTUAL SAVINGS ON ONE OF YOUR OWN JOBS.** Pick a troublesome drilling operation, install a Copilot, and see the actual results. Write us today.

Special Devices
COMPANY
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operation cost figures. Frequently, these overhead departments have been measured, placed on incentive and the costs reclassified as direct labor. Of this type, inspection is an important example, especially today when many parts get 100 per cent inspection.

What Is Data

The standard data method of establishing time standards is not new. It is not complicated. It is little more than an extension of a time-study. To illustrate; the usual study consists of a number of cycles which are observed and for which watch readings are recorded for each of its elements. Then one "time" is selected from the several recorded for each of the elements. This "time" is converted by proper rating to that required by the normal, qualified operator, and a percentage for relaxation is added to suit the type of work done. Now, if a number of studies were compared before standards were set, the procedure would lead to standard data. The two slight differences would be that:

1. Several studies would contain elements not recorded on others.
2. Variable elements would require analysis with dimensional factors, using curve plottings.

The correlation of several studies will result in a series of recorded standard element times. These are used then to set operation standards for any jobs which fall within the range of the work studied.

Method Changes

In the same way, standard data can be used to arrive at a new standard for an improved method. This is of great value to progressive firms because of the many operation changes made every year. Probable gains can be compared with the costs necessary to effect them, and

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DEPENDABLE...

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Tools reduce costs.



The
WIGGLER
has had its
day!



There was a time when the wiggler was considered "tops" for positioning a machine tool spindle. BUT, THAT'S NOT TRUE ANY MORE.

The Center Scope is now the fastest method for accurate centering of a machine tool spindle. It has a trimming screw to compensate for spindle run-out, which European-made microscopes do not have. 45X magnification makes it easy to work to tenths.

As a top-flight mechanic, you should own a Center Scope—or, if you feel that the boss should buy one, put the bee on him.

Center Scope with Illuminator
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Edge Block for use with Cen-
ter Scope\$23.00

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Kearney & Trecker Products Corporation
MILWAUKEE 14, WISCONSIN

it can be learned beforehand which proposals are economically sound. This ability to predetermine time standards can be even more important in post-war planning by being applied to the selection of ways to manufacture new products.

Besides the important over-all advantages of standard data in predetermining correct incentive standards, the "upkeep" problems themselves are more satisfactorily solved. The questions concerning changes in standards are more convincingly answered. This advantage involving the maintenance of good industrial relations deserves emphasis.

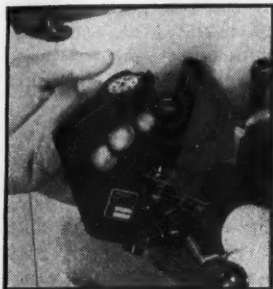
Retaining Confidence

Here is the point. A change of method necessitates revision of standard time in order to maintain a consistent relation between work done and time allowed. Revisions require the subtraction or addition of elements. With element standard data, the revisions can be made by changing the elements involved, as a rule, without introducing the human variables that go with a new time study.

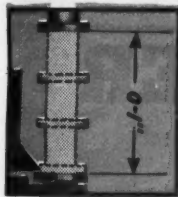
The elements to be changed are recorded as part of the permanent standard data and, in explaining the fairness of the revision, are cited as having the same values that are allowed for all like conditions. The operator reacts favorably because he expects no more nor less than is allowed his fellow-worker. And the repeated explanations of the use of standard element times create confidence through the knowledge that equality of opportunity to increase earnings exists in all standards set from data.

Confidence is highly desirable because of its important effect upon attitude, which in turn determines the rate of production. High earnings gained by large quantity pro-

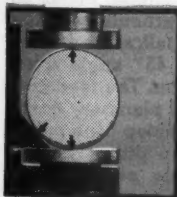
Why Not SEE Rather than feel



Weight of Gage and operator's hand rests upon the fixed contact. Gage is only $\frac{1}{8}$ " wide.



The upper or reference contact is adjustable to any dimension within one inch.



Rockstop locates work in center of contacts and is adjustable for size.

FEDERAL INDICATOR SNAP GAGE with Retractable Anvil Adjustable for Size No Lost Motion

This Model 1330 P-100 Visual Dial Indicator Snap Gage marks a decided step ahead in gaging practice. Conventional type, fixed or solid snap gages depend upon "feeling", and personal variations in the sense of touch influence the inspection accuracy. But, you see with this.

The Model 1330 P-100 has other advantages too — The retractable anvil makes it easier to apply, and it eliminates all excuses for marring the surface of highly finished workpieces. It is easily adjusted to any dimension within one inch and locked in place. There is no lost motion. The movement of the sensitive contact is transferred directly without error to the Dial Indicator. The weight of the Gage and the Inspector's hand rests upon the fixed or reference contact. It is thin: only $\frac{1}{8}$ ". It is small; not over 6" at the longest point. It is light; weighs only 15 ozs. It reads in tenths (.0001"). Contacts are hard wearing Norbide (Made by Norton Co.) For more details concerning this modern snap gage write

FEDERAL PRODUCTS CORPORATION
1144 EDDY STREET
PROVIDENCE 1, R. I.



A light thumb pressure retracts the sensitive contact. Work surface is not marred. The contact movement is transferred direct to indicator.

FEDERAL

PRECISION MEASURING INSTRUMENTS

duction on correct time standards is the ultimate to be sought. The reasons are obvious. The higher standards of living so desired by all of us can come only from the dual effects of good incentive operations in which costs go down and earnings rise.

Incentive-Control

A high level of productivity is the basic cause from which come all the beneficial results of incentive. Therefore it is being very short-sighted to compromise the future of an organization by jumping headlong into a simplified expedient which seems to offer quick solutions to production and wage problems. A little more serious consideration given to the manner and methods may prevent many more troublesome consequences later. The old adage about "an ounce of prevention" certainly applies to incentive administration.

Remember that incentive can be

used to bring about unbelievably large benefits for management and labor if waste time is first segregated and then minimized.

Remember that fair dealing is a prerequisite to securing and maintaining the confidence necessary to higher productivity and hence low cost.

Remember that the standard data method is a logical development from good time study practices which, because of its greater economy and speed, greatly assists the establishment of fair measurement for practically all work efforts in the usual industrial plant.

Remember that one can't expect to get any more out of a program than he put into it, and an incentive plan must be looked at as a major policy. With the best efforts of both management and labor, both may continue to enjoy its potentially unlimited benefits.

(Concluded in the October issue.)

Small Parts **MILLER**

With Added Power Longitudinal Feed

**BUILT-IN ACCURACY
1 H.P. MOTOR-IN-BASE DRIVE
TIMKEN BEARING SPINDLE**

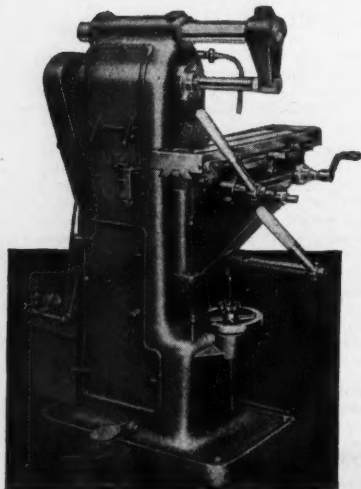
The No. 3 WIGGLESWORTH MILLER produces a fine finish, free from chatter marks on small parts within its range. Particularly adaptable to the manufacture of small arms parts.

Drive is through a pair of 45° angle spiral gears in the saddle to the worm. The feed gear mechanism consists of a set of planetary gears. Drive to table is taken from a 3-step cone pulley on rear of spindle to a 3-step pulley in feed shaft. Planetary gears provide proper speed reduction to spindle to give proper feed rates to table. Six spindle speeds are obtainable from 150 to 800 r.p.m.

IMMEDIATE DELIVERY WITH HIGH PRIORITY

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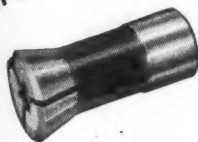
**WIGGLESWORTH
MACHINE TOOL CO. 191 BENT ST.
CAMBRIDGE, MASS.**



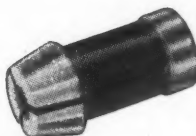


Style "B" Master Feed Fingers and Pads

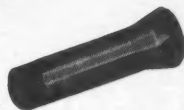
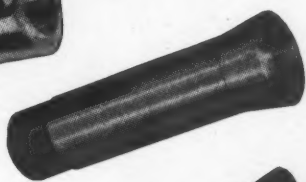
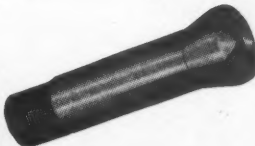
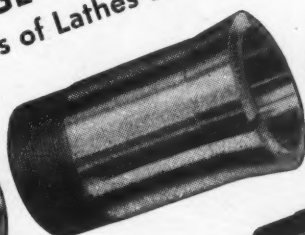
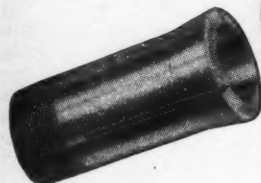
HARDINGE Precision Collets and Feed Fingers for all makes of Automatics, Turret Lathes and Chucking Machines



Style "S" Sure-Grip Master Collets and Pads



HARDINGE Precision Collets for all makes of Lathes and Milling Machines



"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"



27 Spindle Speeds

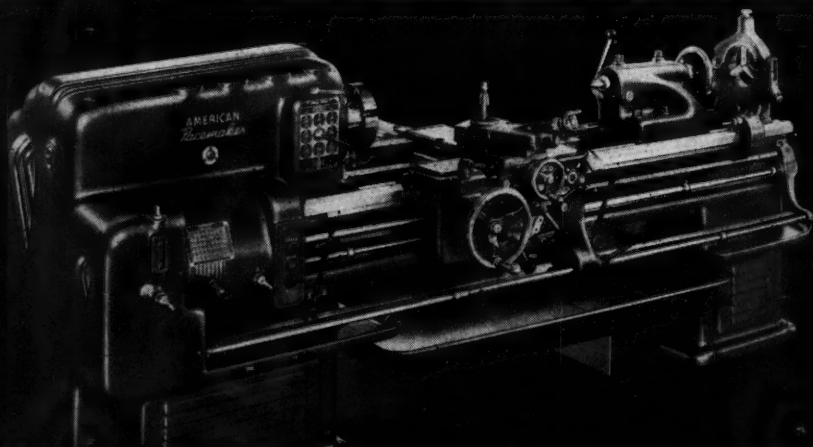
with only 2 control levers



Convenience of control and ease of operation are two of the outstanding characteristics of the new "American" Pacemaker Lathe.

Imagine being able to secure any one of 27 spindle speeds thru only 2 conveniently placed direct reading levers without having to refer to index plates or having to retain lever positions in one's mind. Operators are enthusiastic in their praise of this new speed control. It makes their work easier; they produce more work because of it and the pay roll dollar buys more as a consequence.

This and other fine features of the "American" Pacemaker are thoroughly covered by Bulletin No 15



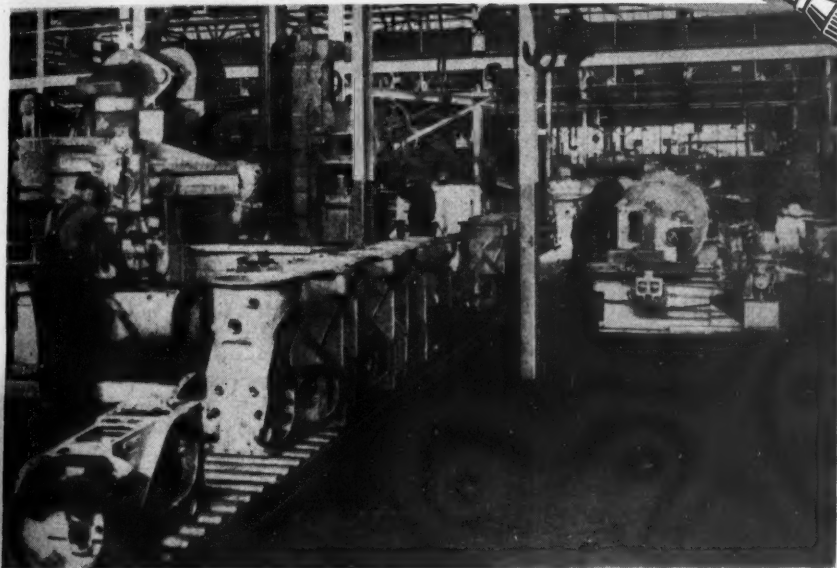
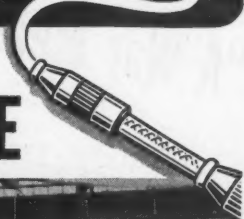
THE AMERICAN TOOL WORKS COMPANY

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CINCINNATI, OHIO, U. S. A.

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MEANS
BETTER MAINTENANCE



• Very often, *correct* lubrication is the remedy for difficult maintenance due to excessive wear.

Sinclair provides *correct* lubrication for **MACHINING EQUIPMENT** of all types with a range of specialized oils and

greases that permit a reduced inventory of lubricants... also Cutting Oils and Coolants adapted to every individual problem.

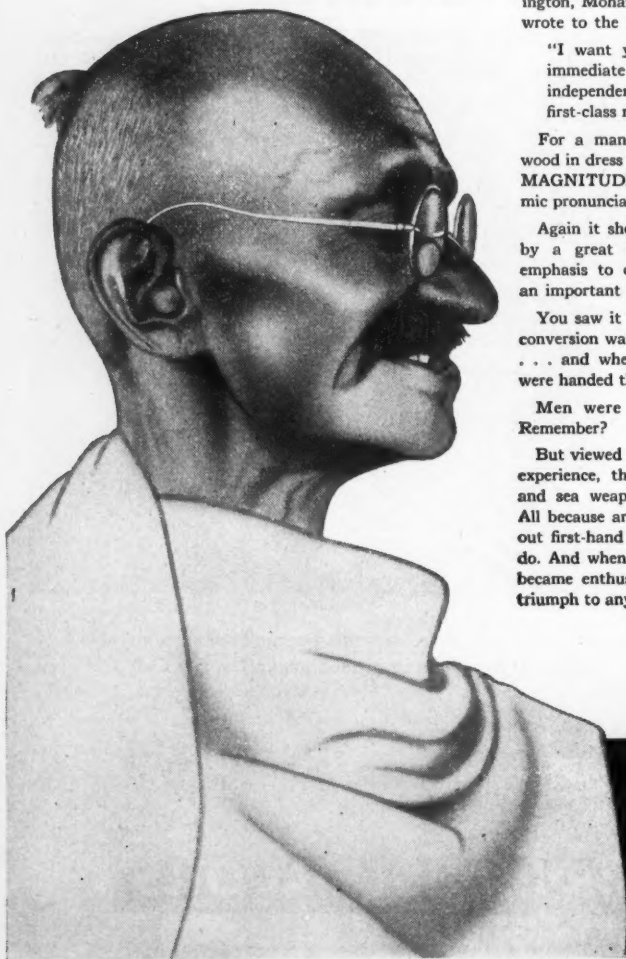
(Write for "The Service Factor"—published periodically and devoted to the solution of lubricating problems.)

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Then he said to himself

"A War Measure of First-Class Magnitude"



WHEN the standing of India was occupying the attention of Washington, Mohandas Karamchand Gandhi wrote to the India League of America:

"I want you to look upon the immediate recognition of India's independence as a war measure of first-class magnitude."

For a man so definitely non-Hollywood in dress or words "FIRST-CLASS MAGNITUDE" amounts to a cataclysmic pronouncement.

Again it shows that one who is fired by a great idea automatically adds emphasis to enthusiasm! And *that* is an important business measure.

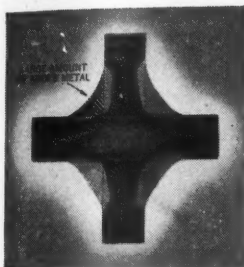
You saw it well illustrated when war conversion was hurled at manufacturers . . . and when "impossible" schedules were handed them.

Men were far from enthusiastic. Remember?

But viewed in the light of subsequent experience, those quotas for air, land and sea weapons today seem modest. All because aroused men quickly found out first-hand what Arc Welding could do. And when it did the job well, they became enthusiastic . . . which brings triumph to any front.

"A War Measure of First-Class Magnitude"...he says

CONVENTIONAL WELDING



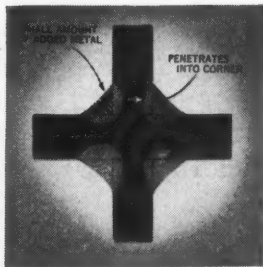
TYPICAL FILLET WELDS

STRENGTH: Stronger than plate
SPEED: 5" per min.
COST: 100%

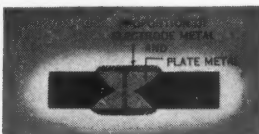


STRENGTH: Stronger than plate
SPEED: 2" per min.
COST: 100%

"FLEET-WELDING"



STRENGTH: Stronger than plate
SPEED: 12" per min.
COST: 42%



TYPICAL BUTT WELDS

STRENGTH: Stronger than plate
SPEED: 9" per min.
COST: 25%



A Lincoln engineer is available nearby to help you apply "Fleet-Welding" Technique. Write for Bulletin No. 440 which gives complete explanation of the simple technique and the welding procedures.

THE LINCOLN ELECTRIC COMPANY
CLEVELAND, OHIO

LOOK, MAHATMA: While you pondered on the magnitude of political measures for winning, Lincoln Engineers were enthusiastically working out a very practical measure that is away out in front in magnitude:

"FLEET-WELDING"

A First-Class Production Measure
... of First-Class Magnitude

This new, revolutionary technique using "ARC-FORCE" to speed the welding of all types of joints in plate, shapes and sheet is bringing back reports of 25% to 75% faster welding... also savings in electrode material and power. Cases also are reported where back-chipping and plate beveling are eliminated.

The savings shown at left are typical of this new technique developed by Lincoln engineers.

America's greatest natural recourse
ARC WELDING

Recent Progress in High Speed Tapping

Tapping Machine Improvements—Lubricants and Coolants —Special Tapping Fixtures

By C. W. HINMAN
Designing Engineer

SPEED and quality in present-day light manufacturing operations have risen to hitherto unattainable heights, due largely to the high efficiency of modern tapping machines.

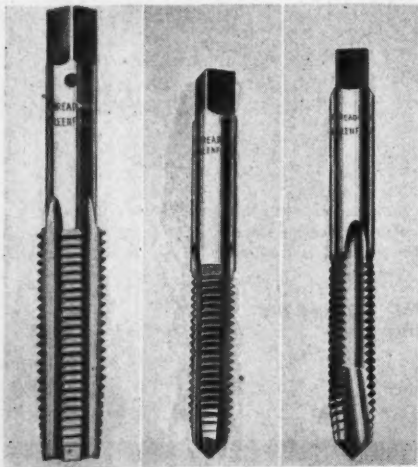


Fig. 1 — Commonly-Used Commercial Taps. Left: four flutes. Center: three flutes. Right: Spiral-Pointed. There are, however, many designs of special-purpose taps. The spiral-pointed tap can be made with two, three, or four flutes for small, medium, or large holes, and is used for through holes at high speeds. The angularly-ground faces on the lands around the point curl the chips, drive them ahead of the cut, and prevent them from clogging the flutes.

The hourly production, faithfulness in reproduction of thread forms, and accuracy of the work done in these machines exceeds anything we could have hoped for ten years ago. However, to a large extent this progress will have to be credited to the necessities of war. The number of tapped holes needed ran into astronomical figures in such parts as guns, tanks, bomb-sights, superchargers and automobile and airplane assemblies—just to mention a few of them.

Better results in tapped products followed in the wake of radical changes in the design of tapping machines. The machines were newly engineered from the ground up, the objective of the engineers being to build tapping machines that would increase tapping sensitivity and that would suit the different operating characteristics of the taps themselves.

Everyone knows that such progress results only from long research and costly experimental work, but such work must be done if the sought-for results are to be obtained. It was necessary to meet specified tolerances for pitch diameters and thread leads, close fitting allowances, and the precision finish that modern threading specifications demand.

The first necessity, to meet the increasing pressure of war production, was the application of individual motor drive. This was followed by speed changes for the different diameters of taps, ball bearings, methods of lubricating the work, disposal of chips, a built-in air control for automatically lowering and raising the

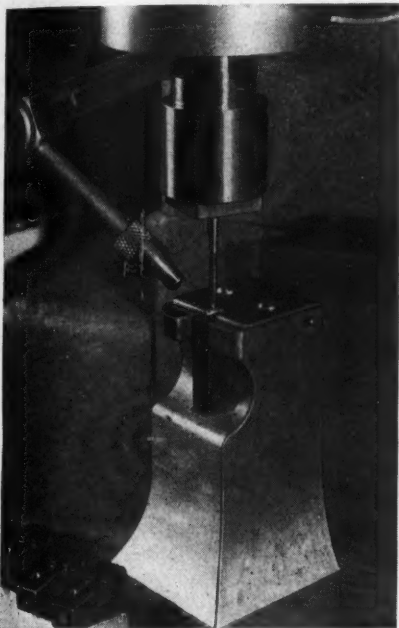


Fig. 2—Set-up for tapping a rear sight slide assembly for a rifle, using a Haskins No. 2-C air-controlled tapper and a two-flute, 130-inch, 40 thread tap. The work is held in a post-type tapping fixture. This is a retapping job, and the chips are of paint consistency.

spindle, an adjustable counterbalance for the spindle chuck and accessories, an automatic valve by which the tapping speeds could be controlled "in" and "out," and a foot pedal by which the operator could start or stop the tapping cycles under control of the valve itself.

The adjustable counterbalance is

In War, as in Peace...

CERRO ALLOYS

Save time and cut costs!

CERROMATRIX (Melting Temp. 250° F.) For securing punch and die parts, anchoring machine parts without expensive drive fits, short run forming dies and other metal-working applications.

CERROBEND (Melting Temp. 158° F.) Used as a filler in bending thin-walled tubing to small radii. Easily removed in boiling water. Also used for aircraft assembly jigs, templates for forming dies and other purposes.

CERROSAFE (Melting Temp. 190° F.) Used to accurately proof-cast cavities such as molds, gun chambers, forging dies, etc., and many similar applications.

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operated by compressed air. It has a downward pressure on the spindle suitable for entering the tap into the work, while the upward movement counterbalances the spindle weight.

Another tapping machine has a cone shaped friction clutch with three shoes or segments of special leather assembled inside the cup to provide

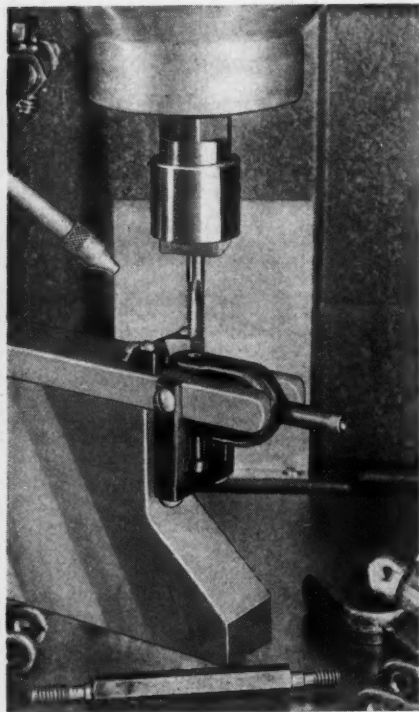


Fig. 3—An effective set-up for high speed tapping is a steel brace yoke for an aircraft assembly. The material is hot rolled SAE 4130 steel, and the tap is $\frac{1}{4}$ -inch, 20-thread, two-flute. The fixture is designed to compensate for irregularities in the workpieces. Lard oil is fed to the work by a pump within the housing of the machine.

for expansion, contraction and long wear. The clutch drives the tap, but if the tap overloads with chips, encounters tough spots, becomes dulled or meets any abnormal cutting condi-

tions, the leather permits the clutch to slip and thus avoids breaking the tap.

In other types of tapping machines, means was developed to control the tap with a vertical lead screw attached on the spindle and over the tapping head. This screw is hardened and ground, and can be exchanged for one that corresponds to the number of threads per inch to be tapped. The upper portion of the lead screw is a fluted hob. The ends of brass guide fingers, after being cut by the hob, engage with the threads on the lead screw and control the feed of the threading tool. An electrical solenoid mechanism engages the fingers during the tapping operation. Contact of the guide fingers on the lead screw is governed by the solenoid movement which is operated automatically by a limit switch.

When the tap becomes dulled or loaded with too much pick-up, or encounters hard spots or packed chips in a blind hole, a friction disc with cork inserts instantly releases the tap and the cutting action stops. After clearing the obstruction, tapping can be resumed at the stopping point because the threads have not been injured. These, and scores of similar details which are too long to discuss here, have led to the improvements in modern tapping machines.

Improvements in taps should also be mentioned. High speed steel taps are now being used notwithstanding that they had heretofore been condemned because it was thought that the smaller sizes would break too easily. However, the new precision tapping machines tend to avoid that trouble. The advantage in using high speed steel taps is about equal to the gain in using drills of the same material. Taps are precision ground and close limits are maintained. Both the lead and pitch diameter are

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The LARGEST BROACHES*
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Mass production of toothed coupling rings for L.V.T.'s is
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ground to within a half thousandth of an inch.

Four Classes of Thread Fits

The following classifications refer to our American Standards of National Coarse (NC), and National Fine (NF) tapped thread fits.

Class 1—Loose Fit: For easy assembly of threaded parts where considerable allowance or play is permissible. Use taps with cut threads or commercial ground threads.

Class 2—Free Fit: For assembling threaded parts easily or entirely with the fingers. A small allowance or play is permissible. Use commercial ground thread taps.

Class 3—Medium Fit: For assembling high grade interchangeable threaded parts easily or entirely with the fingers, but must have a minimum allowance or play. Use precision ground thread taps.

Class 4—Close Fit: Fine snug fit needing a wrench for assembly of the parts. Practically a negative allowance. A selection of parts may be necessary. This class is the highest grade of precision threaded parts. Use taps with precision ground threads.

Lubricants and Coolants

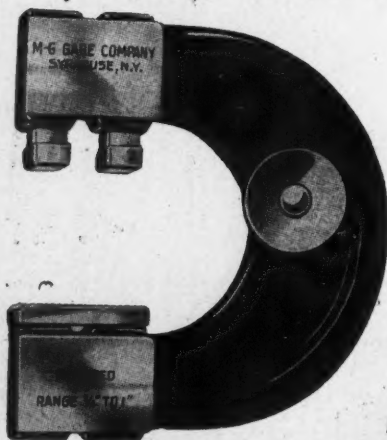
In tapping operations a good grade of lard oil is the best lubricant, but is expensive. A mineral oil having a lard oil base can be substituted at times. Never use machine oils of any kind. Coolants are not necessary for tapping because the circumferential travel of the cutting teeth per minute is not fast enough to heat the tap. A good lubricant on the cut is necessary to reduce the power to cut and to prevent friction and wear on the tap. The following list of lubricants is recommended by tap manufacturers.

Adjustable Limit Snap Gage Specialists For 28 Years

Exclusive Features

1. Patented locking device, adjusting and locking means completely housed within the head.
2. Square shanks on pins and anvils to prevent turning in the holes.
3. Light weight but very strong frame to give user a better sense of feel on his work.

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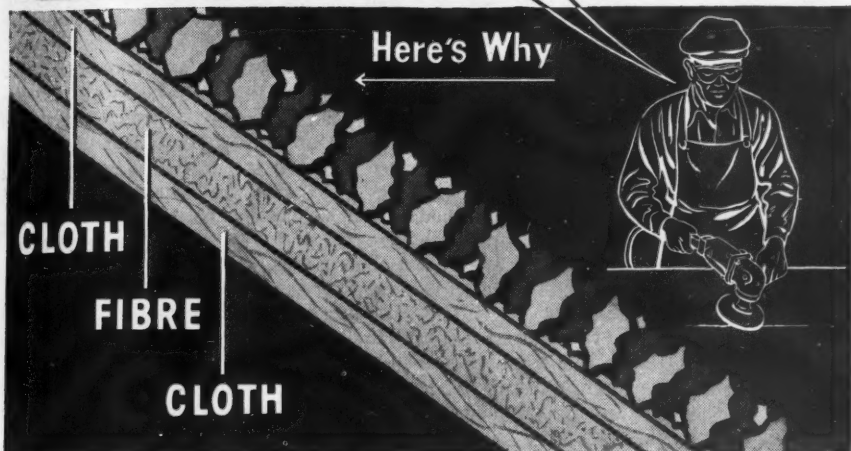


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Speed up grinding jobs safely—switch to Weldisks (all grits 320 to 16). For free trial samples, write: Abrasive Products, Inc., 520 Pearl St., So. Braintree, Mass.



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SOUTH BRAINTREE 85 MASSACHUSETTS • MAKERS OF JEWEL COATED ABRASIVES

Recommended Lubricants for Tapping

| | |
|---|--|
| Cast brass or bronze..... | Light mineral or soluble oil |
| Forged brass or copper..... | Mineral oil with lard oil base |
| Cast iron..... | Light mineral or soluble oil |
| Aluminum and its alloys..... | Add kerosene to light mineral oils, and sometimes add good lard oil |
| Alloy steel, low carbon steel forgings..... | Good grade of sulphur base oil |
| Magnesium alloys..... | Dry, or mixture of 10% lard oil and 90% light mineral oil diluted with 30-40% kerosene |
| Stainless steels..... | Soluble oil with sulphur added. On tough jobs use paste of white lead and a high sulphur base lard oil |
| Beryllium copper..... | Lard oil |
| Nickel silvers and cupro-nickels..... | Sulphur base oil |
| Aluminum bronze..... | 1/2 kerosene and 1/2 lard oil |
| Copper-silicon alloys..... | Kerosene and lard oil mixture |
| Laminated plastics..... | Dry, or water |
| S.A.E. nickel alloy steels..... | Sulphurized mineral oils |
| Carbon sheet steels..... | Sulphur base oil |
| Nitriding steels..... | Sulphurized mineral oils |
| High nickel alloys..... | Sulphurized mineral oil with lard oil |
| Hard rubber..... | Any good grade of tapping oil. |

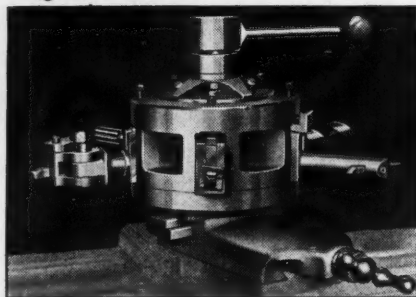
of the taps ordinarily used should be considered, as illustrated in Fig. 1. In this first article the object is to show tapping set-ups of the simplest types, and conclude with the more complicated machines, tools and operations in subsequent installments.

Tapping Parts for Rifles

The Tap Design

Before taking up the actual tapping operations with the work parts shown in modern holding fixtures, at least three of the principal designs

Figure 2 is a close-up view of a Haskins air-controlled tapping machine using a two-fluted gun tap secured in the chuck for tapping the hole in an assembly of a rear sight



5 STATION LATHE TURRETS FOR THE POST-VICTORY YEARS

OUR NEW IMPROVED TURRET HEADS are a Vital war-time necessity in machine shops and plants today. Also Vital for your Post-War planning where COMPETITION will be so keen — tomorrow. For the Victory years ahead, order now, equip your machine shop or plant with OUR NEW IMPROVED TURRET HEADS.

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ALLOWING MINUTE ADJUSTMENTS WITH 10 ACCURATE TOOL POSITIONS

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Made in Four Sizes
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Steve is in there
"plugging"
for you
—still

BACK in pre-induction days when he was working for your Industrial Supply Distributor ♦ Steve kept plugging to find the things you had to have to keep your war outfit moving on decent schedule.

You didn't see Steve very often—but you profited by his help every day. He knew of sources for the materials you had to have—and he spent hours on end running them down by 'phone. He was plugging for you

then and he is in there plugging for you still.

Today your Industrial Distributor's man-supply is reduced too, but he is organized to help you shortcut a lot of your routine. He can purchase everything that you and many other large users require, on a single shipment from the factory—can draw on stock for deliveries to you as needed.

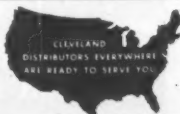
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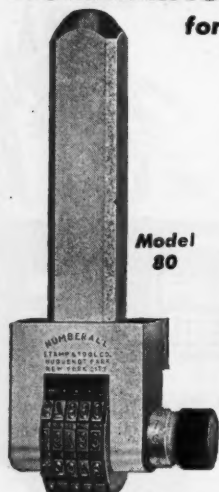
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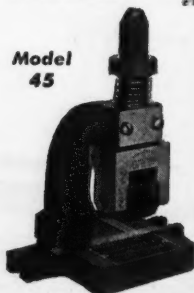
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*for stamping into
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New, quick Set Machine. One wheel can be turned quickly by knurled knob for consecutive numbering.



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Platform for stamping Name Plates and other small articles.

Made in 1 to 20 wheels. Stamp in perfect alignment. Shank for Hand or Press Stamping.

Improved Type Holders, Hand or Press Style. Super Quality Steel Type. Type is easily, quickly, loaded and unloaded. Simplest construction. A pin holds the type securely. No screws nor springs. Made in various sizes: 1/32" to 1/2" figures and letters.



**Model
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**Steel
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used in army rifles. The part is of steel and is a partial assembly; a finish has been applied before bringing it to the machine. Therefore, this operation is a retapping job to clean the threads. The tap size is 0.130 inch, 40 threads per inch, and a

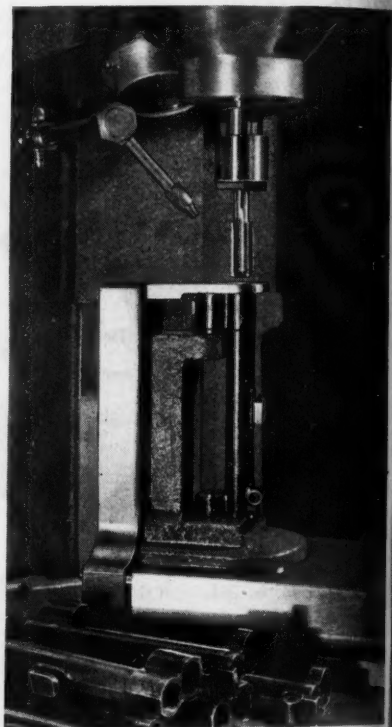


Fig. 4—An easy, quick-acting fixture that slides out for loading and in for tapping. The work-piece is a steel gas cylinder which is a component part of an Army rifle. The tap is 4-inch, 32-thread, four flute, two-thread chamfer.

Class 3 fit must be maintained in a hole 0.400 inch deep.

The tap is spiral pointed (see preceding figure), but when two flutes are used, it is usually called a "gun tap" or a "chip driver tap." The angle on the point, in this case, drives the cuttings ahead and re-

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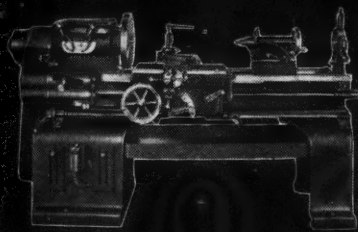
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moves them from the hole when the tap is withdrawn. The r. p. m. of the tap "in" is 770; the r. p. m. for backing out the tap is 1540. Air pressure on the spindle on the down-stroke is 17 lb., and on the up-stroke 14 pounds.

The holding fixture shown in Fig. 2 is the post design in which the workpiece fits into a slot that prevents it from turning with the tap, the upper end of the work locating under a positively attached stripper plate, as seen in the picture. This retapping operation is rather slow, being only 400 pieces per hour, this deficiency being due to removing the finishing material instead of metal chips from the work.

Tapping Parts for Aircraft

Figure 3 illustrates the tapping of one hole in a hot rolled steel base yoke for use in an airplane assembly. The material specifications are S. A.

E. 4130. The hole opposite the one to be tapped is clearance for a bolt in the assembly, and is also used to locate the part in the tapping fixture.

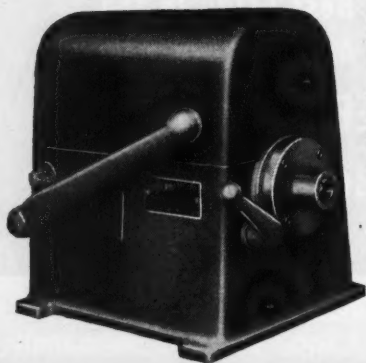
The tap cuts a $\frac{1}{4}$ inch-20 thread, which is U. S. Standard size; it is a two fluted gun tap for a "through hole" $\frac{1}{4}$ inch deep, and the work must pass inspection for a Class 2 thread fit. The tapping r. p. m. are 1250, and for backing out the tap 2500 r. p. m. are used.

This is a high speed tapping operation that produces 1200 pieces per hour. The downward air pressure on the spindle and tap is 21 lb., and the upward counterbalancing pressure is 15 pounds.

A swinging leaf fixture is designed to hold the work and to compensate for all of its rough irregularities. The leaf pivots on a bolt shown in the rear. The work is held in a slot and centered in a V-block provided at the end of the leaf. A posi-

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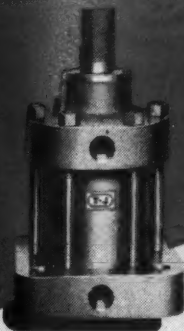
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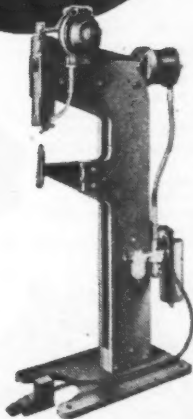
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tive locating pin is held vertically in a yoke attached under the leaf. The pin aligns the tap hole with the tap by engaging in the clearance hole when the work is placed over it. This fixture is "fool proof" because the locating pin is too large to enter the hole to be tapped.

Tapping a Gas Cylinder for Army Rifles

A right angled vertical post tapping fixture designed with a cast iron sliding base for loading and unloading the work is illustrated in Fig. 4. The body of the fixture can be slid toward the right for placing the work in a vertical position over two positive pins, one pin being located at the bottom of the fixture and the other at the top. Both pins enter the larger holes in the lugs on the work. The fixture with the work is then pushed under a positive stripper plate attached on the tall right angu-

lar post at the left. This movement is halted by a positive stop that positions the tap hole directly under the spindle for tapping.

The workpiece is a steel gas cylinder used in rifles, and the operation consists in retapping a 9/16 inch - 32 special thread, after finish has been applied, using a four fluted tap with a two-thread chamfer ground on its point. The tapped hole is 17/64 inch deep and must pass a Class 3 gage inspection. Tapping r. p. m., 360 "in" and 720 "out." Air pressure of 18 lb. on the down-stroke of the spindle, and 14 lb. on the up-stroke were used. The hourly production is only 450 pieces, being low on account of the conditions involved when retapping to remove the finishing material.

Tapping Primer Fuses

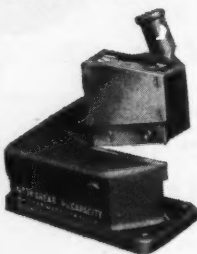
Figure 5 illustrates an efficient clamping fixture that holds round

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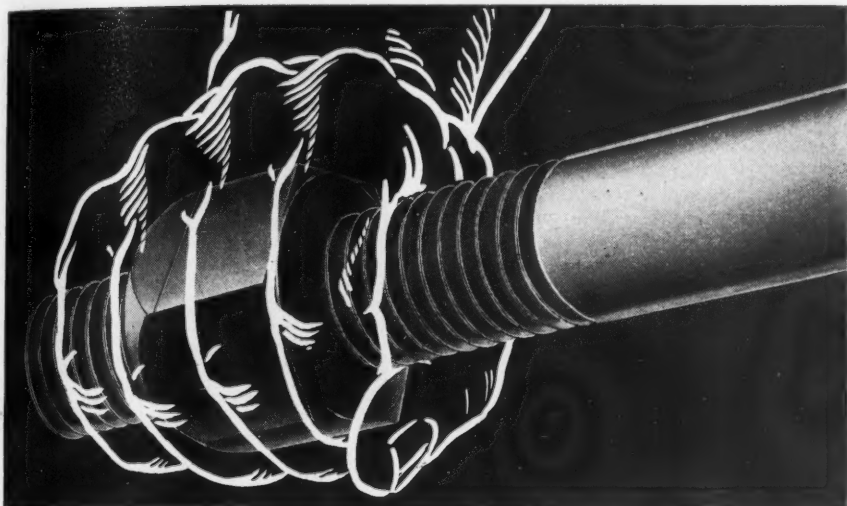
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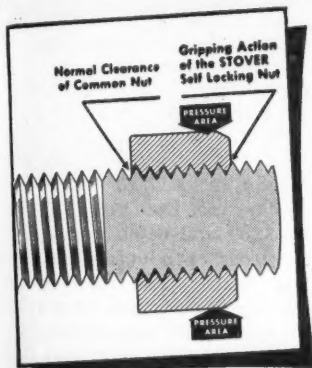
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work for tapping. This fixture is an air controlled vise that clamps and releases the work automatically by lowering and raising the spindle of the machine. No stripper plate is required here because when the tap is backed out, the vise jaws and the head on the workpiece keep the piece from pulling up. The work is of brass bar stock and is called a "primer fuse part." A lubricant of light mineral or soluble oil is used, or

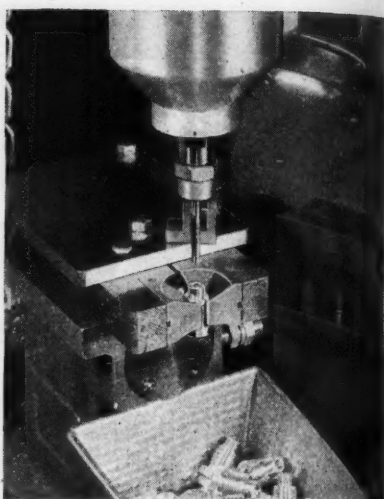


Fig. 5—Set-up for tapping a fuse primer. Machine: Haskins Special Air-Controlled Tapper. Tap: $\frac{7}{32}$ -inch, 32 thread, three flute. An automatic air vise with interchangeable jaws is used, the vise being adaptable for holding round work of different diameters.

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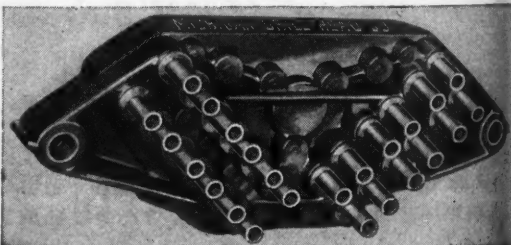
The tap size is $\frac{7}{32}$ inch - 32 pitch, having 3 flutes and a 4 thread chamfered point. The tapped hole is a Class 3 fit and is $\frac{7}{32}$ inch deep. The r. p. m. of the tap "in" and "out" are 3200 and 6400 respectively, and the gross production is 1800 pieces per hour. The air pressure for operating the spindle down and up are 20 and 14 lb. respectively.

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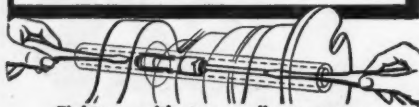
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the work are removable. With this feature, the jaws can be exchanged for others that will hold a large variety and different sizes of work composed of square, hexagonal and round parts.

Tapping Five Small Holes in Steel Clamps

The fixture shown in Fig. 6 holds two pieces of semicircular work at



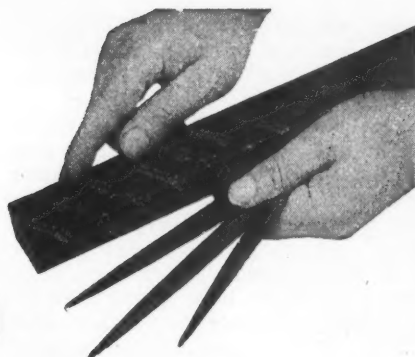
Fig. 6—Special dial-feed fixture for tapping 2,500 holes per hour in lower clamp plates. The tap is No. 6, 40 thread, two-flute. Both feed and return are controlled by air.

one loading. Fourteen equally spaced notches are cut in the periphery of a circular dial to provide for indexing each tap hole directly under the tap. An indexing pawl in connection with an air cylinder rotates the dial and work automatically from hole to hole when the spindle is lowered, and just before tapping begins. The finished piece is removed from the fixture and a new one is placed in position while the opposite piece is

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being tapped. A positive stripper plate, attached in the rear, holds the piece down while the tap is backing out.

The blank is S. A. E. 1020 sheet steel, and has been previously embossed and blanked in progressive dies. The holes to be tapped are embossed above the surface of the work and are high enough to obtain a No. 6-40 tapped hole 7/16 inch deep. The piece is the lower plate used for clamping together a semicircular "bank" of insulators and terminals in an automatic telephone central office switch. A mixture of light mineral oil with pure lard oil is used as a lubricant.

The tap, which is called a "gun tap" and is of the "chip driver" variety, has 2 flutes and a spiral point. The purpose of the spiral point is to curl the chips and drive them ahead of the cut in order to prevent packing them in the flutes. Small sizes

of tapped holes, under about 1/4 inch in diameter, in all metals and especially in steel, are threaded with 2-fluted gun taps. The Class of fit specified is No. 3, and a tap with precision ground threads is necessary. Air pressure for operating the spindle up and down are 13 and 15 lb. respectively.

The r. p. m. for tapping "in" and "out" are: 2300 and 4600 respectively, and while each part has five tapped holes, yet the output is 500 pieces per hour. A multiple-head tapping chuck could be profitably used for this job if the output is high enough to justify the extra cost of designing and building the head.

(All photos courtesy R. G. Haskins Company)

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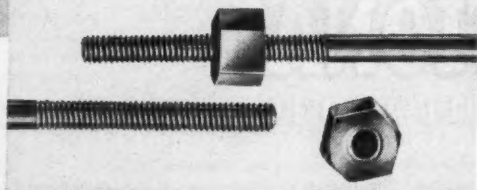


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CONCUSSION

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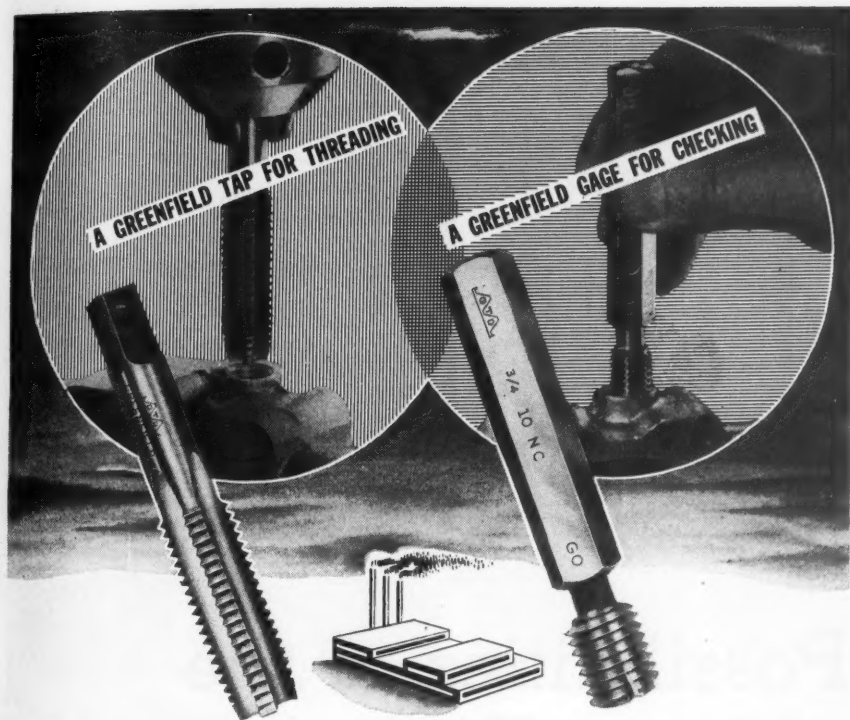
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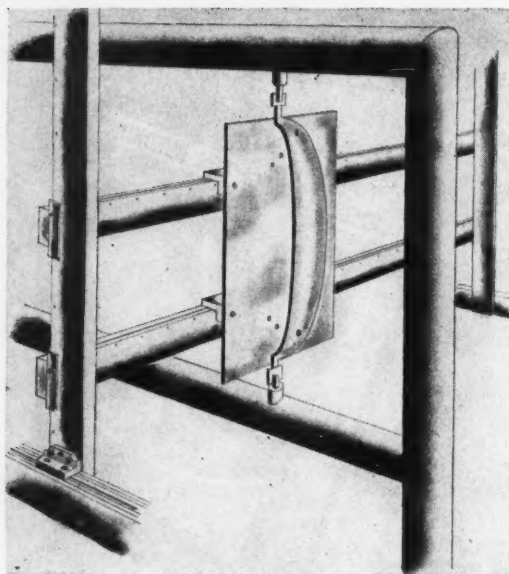
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This Drawing Shows How an Index Template may be Used in the Master Tooling Dock for Positioning Jig Locators with Tooling Holes

Second half of article, in which the author presents the most important considerations in designing fixtures for the Master Tooling Dock

Possibilities of the Master Tooling Dock

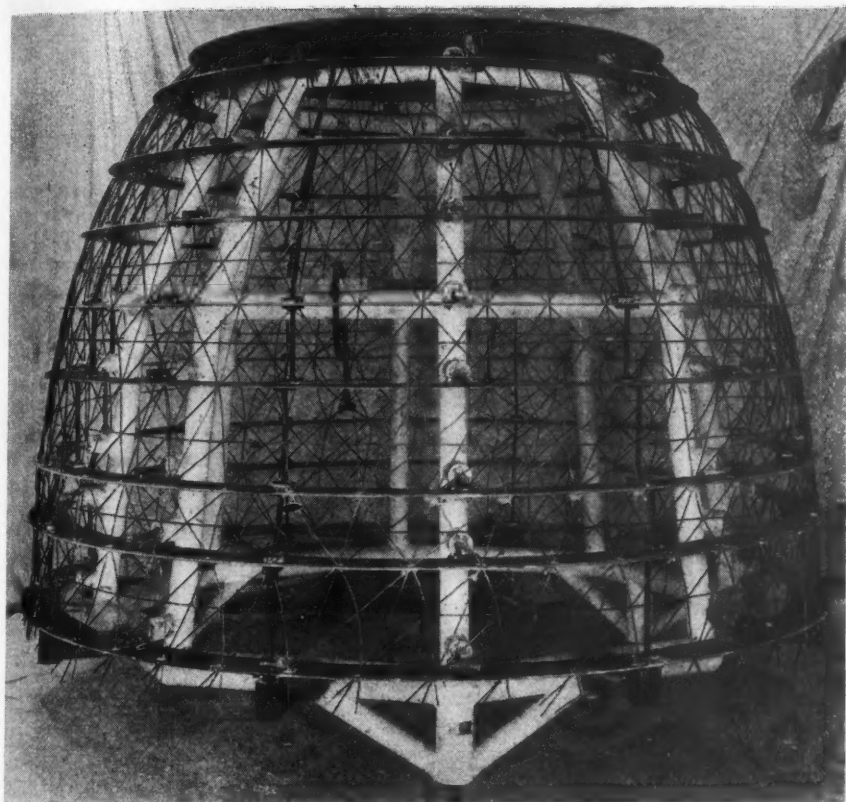
By LELAND A. BRYANT,

Consulting Engineer, Consolidated Vultee Aircraft Corporation

THERE is little or no need for mastering fixtures when the tooling dock is employed, because the dock itself is a universal master. However, if special circumstances warrant the construction of a master, the dock can be used to facilitate the process, since, from the viewpoint of set-up precision and coordination, the only difference between a fixture and a master is a matter of sex—one being a male, while the other is a female.

When a master contour model or aircraft "mock-up" is required, the

dock is used exclusively to position and align individual contour templates. The station contour templates are secured to the "backbone" of a steel skeleton which, in conjunction with an inert plastic filler, ensures a stable preservation of line and form in the master model. Through the use of the tooling dock in positioning male templates identical to those controlling the assembly fixtures in strict accordance with loft, an automatic co-ordination with assembly jigs is established. The completion of the



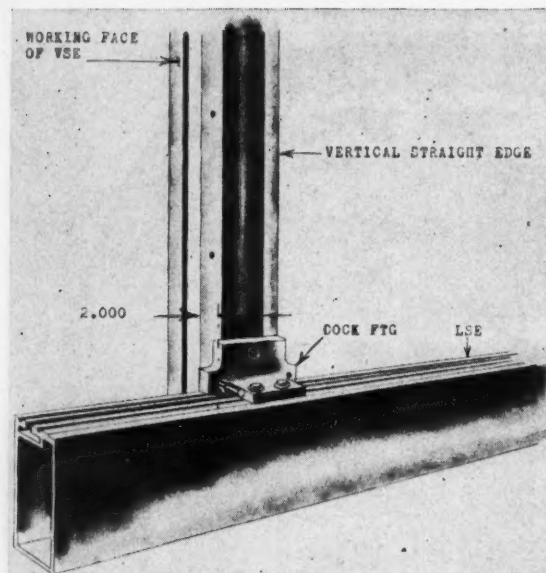
Here is Shown a Master Contour Model or "Mock-Up" which was Set Up in Consolidated Vultee Aircraft Corporation's Main Master Tooling Dock Unit at San Diego, California

model, by fairing in with hard gypsum over reinforcing mesh and developing a lines layout upon its surface, may be accomplished by conventional methods outside of the dock; or, if the lines layout is complex, it may be found advisable to accomplish this work in the dock, using the straight edges thereof to guide the "mouse" during the scribing operations.

It has been found that exceedingly close co-ordination between the master loft and the Master Tooling Dock can be attained by attaching scribes

to the straight edges of the dock and using them to lay out the grid lines that are to be used in fairing the various portions of an airframe. This eliminates the possibility of variations in the grid lines established in the master loft and in the Master Tooling Dock. No appreciable increase in time is required for the dock scribing operations.

For jig boring operations the Master Tooling Dock has shown interesting possibilities. Precision layouts up to 70 x 240 inches can be handled in Consolidated Vultee's small dock unit



This Drawing shows how a Dock Fitting is Used to Position a Vertical Straight Edge Alongside a Longitudinal Straight Edge in a Master Tooling Dock

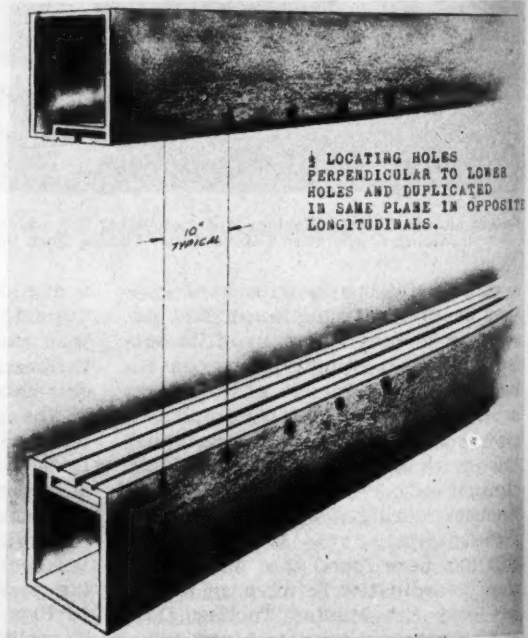
would cost less than either of these.

The three most important considerations in designing fixtures for Master Tooling Dock set-ups are:

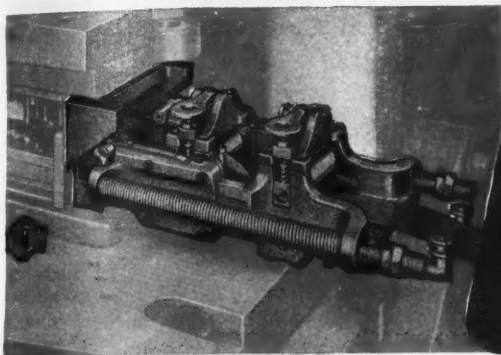
(1) The jig structure need not have machined surfaces from which the toolmakers may work in establishing the position of the jig locators, since these are securely held in the dock, clear of the structure. The securing of the locator to the structure is simply a uniting

operation, and the manner in which

at San Diego with layout time reduced to about 50 per cent of that ordinarily incurred in jig bore or boring mill set-ups, both of which are extremely limited in the size of work which can be handled. A large boring mill with working limits of 60 x 60 inches would cost approximately \$30,000 and a jig bore with limits of 20 x 50 inches would cost more than \$20,000. A complete 20 foot (length) tooling dock, capable of universal application and with far greater precision ranges,



This Drawing Shows how the Centers of Bushed Holes in One Edge of Each Straight Edge Represent the Grid Lines of the Master Loft or Body Plan in the Master Tooling Dock



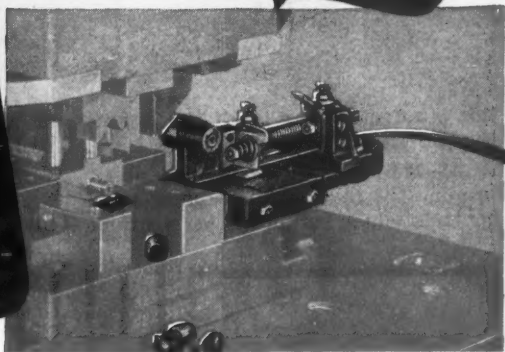
The Dickerman Die Feed

1. Handles coiled stock up to 3/16" thick, widths up to 4".
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The Dickerman Hitch Feed

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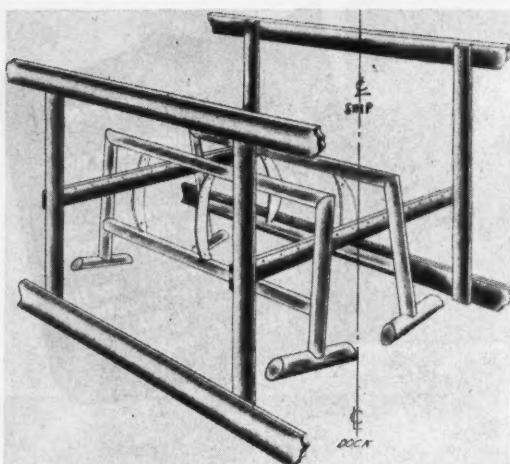
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This Drawing Shows how Fixture Frames are Positioned with Reference to the Center Line of the Master Tooling Dock

this is affected may be at the discretion of the tool designer.

(2) The tool designer should bear in mind the fact that the dimensional controls which establish the positions

of his fixture and note these on the tool design drawing.

(3) The tool designer should show the essential framework of his assembly in phantom and relate the axes

A. I. S. I.



S. A. E.

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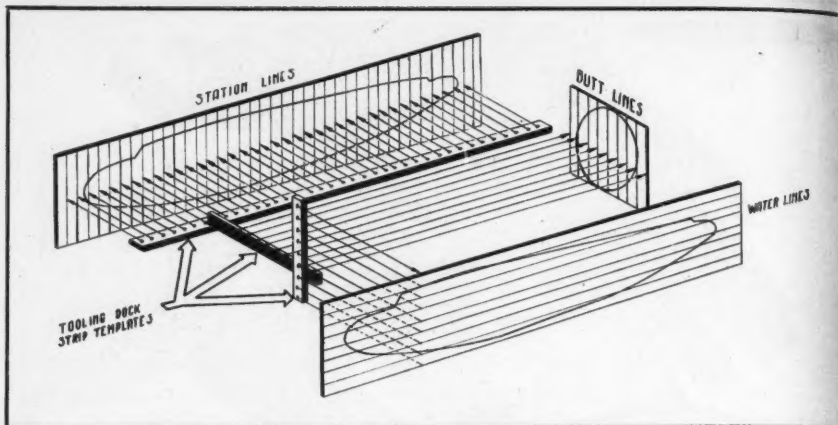
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This Drawing Shows How Strip Templates Provide Exact Dimensional Control for Each of the Three Dimensions in the Master Tooling Dock

of his jig structure to the basic reference lines of the loft, so that the jig structure may be correctly positioned in the Master Tooling Dock during

set-up operations.

It has been found advantageous to prepare with each tool design a sketch showing how the fixture should be set

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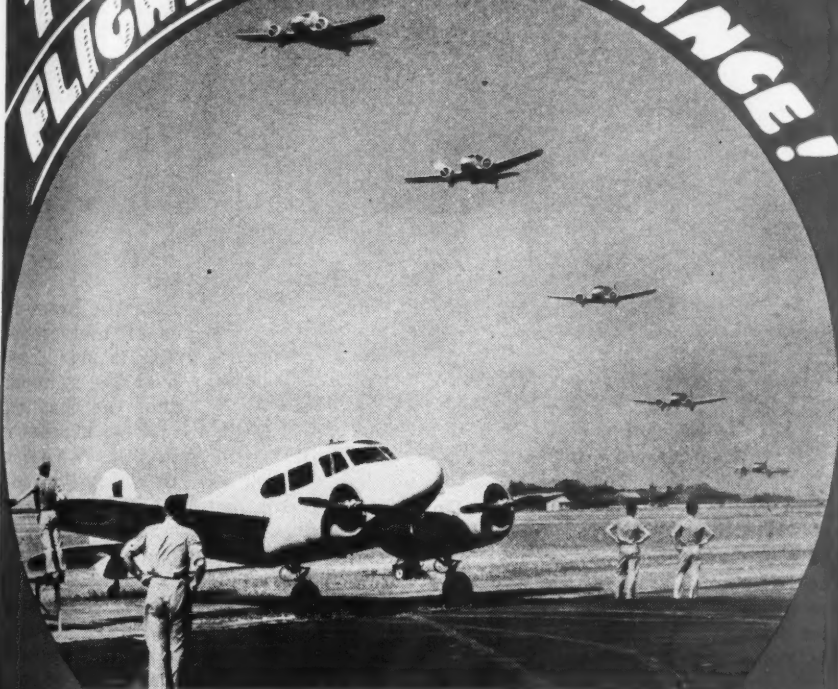


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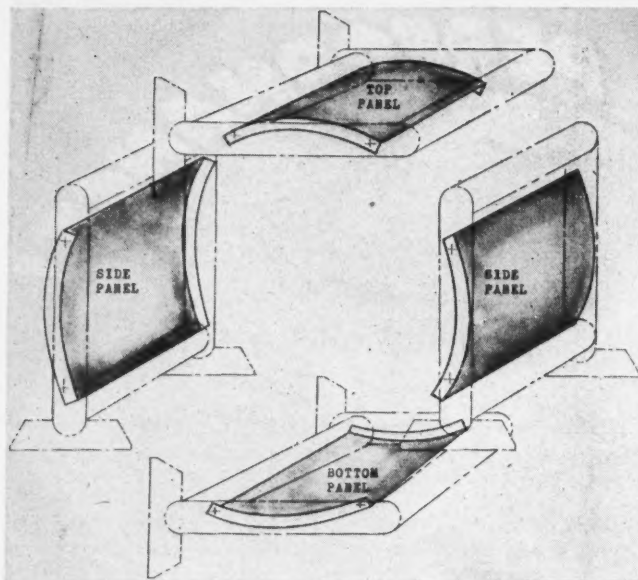
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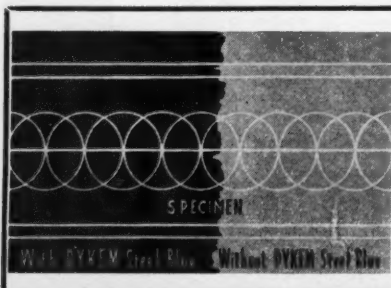


This Drawing Shows How an Airplane Fuselage Section may be Broken Down so that It can be Assembled as a Series of Small Parts, Each of Which Has Been Built in a Picture-Frame Fixture. The Fixtures that Might be Used are Represented by Phantom Lines

In the process of tool proofing, it should be borne in mind that the function of the Master Tooling Dock is to effect a phys-

up in the Master Tooling Dock. On this sketch the correlation between the basic grid lines of the dock and the basic grid lines of the assembly are developed. It is optional with the tool designer as to whether he locates his component parts by nesting to contour blocks or by assembling on tool holes; either way, the tool hole is used to position the locator. In the former case, the tool hole acts simply as a construction hole during the dock set-up procedure.

ical mastering of the numerous assembly fixtures in accordance with loft master layouts and basic engineering dimensions. Therefore, tool proofing begins with inspection and approval of the loft reproductions and templates derived therefrom. The means of producing reproductions of the master layouts should be investigated as to reliability and such reproductions as are released should be stamped "approved" by the tool proofing division.



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Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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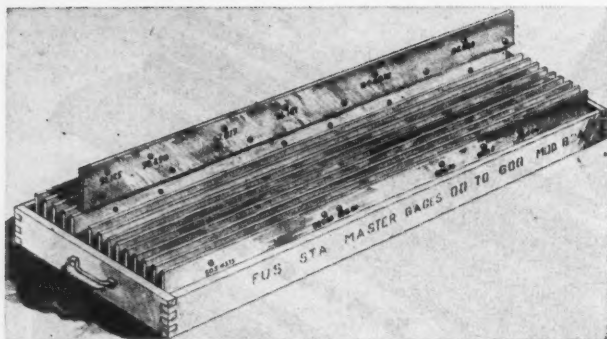
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NEW CASTLE, PA.



Strip Templates Provide Dimensional Control for the Master Tooling Dock. These very simple Accessories may be kept in an Ordinary Filing Cabinet, as Indicated Above

Since the lines layout on a given template usually establishes the pattern of holes required for structural assembly and co-ordination, and because the tolerances required for these cylindrical fits are usually at sub-visual limits, it is desirable that one of the master layouts be drilled and bushed as a master for reproduction. Inspection for hole layouts may then

be physically checked against this master by means of plug gages only. The most efficient scheme for inspecting or tool proofing jigs and masters in the Master Tooling Dock is to conduct a step-by-step examination of the assembly process. Since the assembly of fixtures is confined to a series of repetitive operations, different in detail but identical in purpose, this makes inspection relatively simple and easily controlled. The main work of the inspector is to see that



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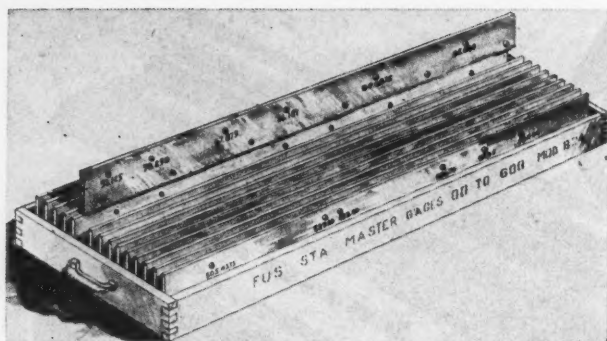
Armour Sandpaper Works

DIVISION OF ARMOUR AND COMPANY
1355 West 31st Street, Chicago 9, Illinois

September, 1944

MODERN MACHINE SHOP

199



Strip Templates Provide Dimensional Control for the Master Tooling Dock. These very simple Accessories may be Kept in an Ordinary Filing Cabinet, as Indicated Above

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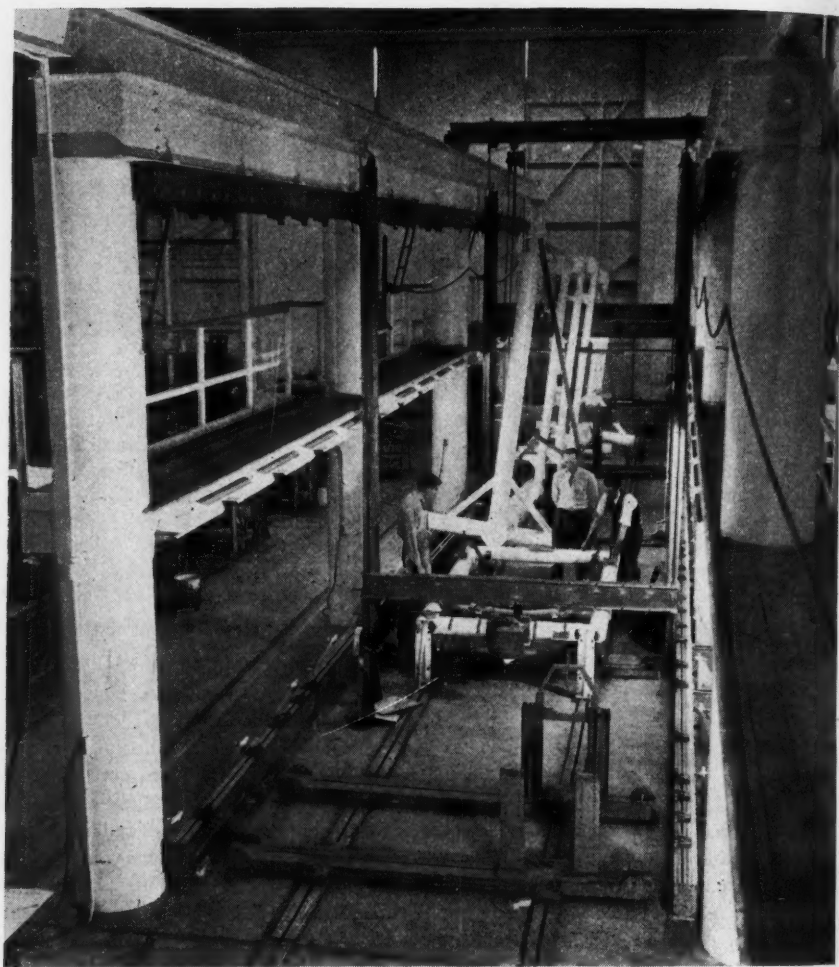


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Inside View of a Consolidated Vultee Master Tooling Dock in Operation

the correct accessories are used and that the dowel pins are free so that there will be no strains. If these check points are satisfactory, the inherent precision of the dock assures positive alignment and positioning well within acceptable tolerances.

Probably the most important consideration in designing a Master Tool-

ing Dock is its foundation. If the dock is to produce tools with maximum accuracy, its fixed straight edges and their "grid holes" must be perfectly aligned—usually within a tolerance of less than 0.001 inch. And naturally this would be impossible without a firm base. Accordingly, the initial dock (built for Consolidated

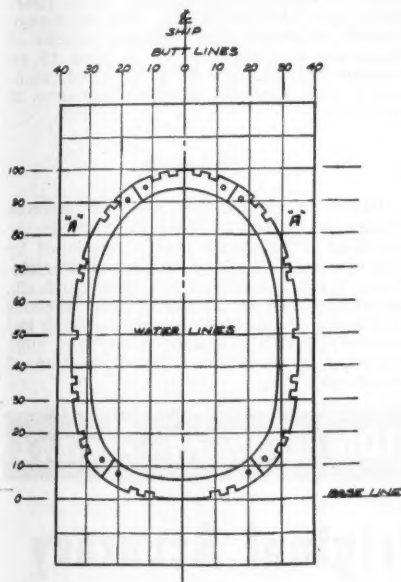
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Vultee at San Diego, California) is supported by a reinforced concrete slab which is tied in and supported by eight 11-gauge steel shell piles. The piles extend 45 feet into the earth (with a 12-foot penetration into firm ground), and develop a safe bearing of 70,000 pounds each. Thus the dock



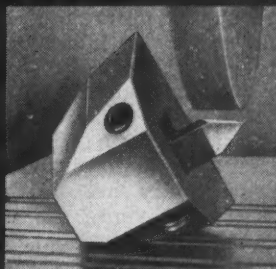
This Drawing Shows How the Bulkhead of an Airplane Fuselage may be Lofted in Accordance with the Horizontal and Vertical Lines of a Grid Plane System. Any Point on the Contour can be Located By Butt and Water Line Intersection. As Per Example: Butt Line 30L/R and Water Line 80 Fall Approximately on Contour at "A".

is able to carry a 350,000 pound "pay load," resist soil movements caused by tide changes, and nullify vibrations due to earth tremors and near-by drophammer operations.

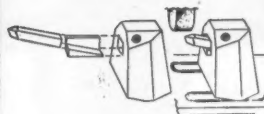
The size of a Master Tooling Dock depends upon size of the work it is to handle. Consolidated Vultee now has two units at San Diego—one 60 feet in length, and the other 20 feet in

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length. The smaller unit is used for setting up small fixtures and for jig boring operations, while the large unit is confined to the work of finishing large fixtures and building master contour models.

Due to machining limitations, it has been found advisable to build the dock straight edges in unit lengths of 20 feet, even though the total lengths may be considerably more. However, when the "fixed" straight edges are secured by micrometric adjusting screws, they can be readily aligned to a tolerance of 0.001 inch by means of electrically-energized wires, an electronic mercury level, and master gages. Trammel gages are used to position the grid holes diametrically opposite one another.

Thanks to a firm foundation, it has been found that the positions of the stationary straight edges vary less than 0.0005 inch in the 60-foot Master Tooling Dock unit at San Diego.

Electronic Current-Regulating Compensator for G-E Thyatron-Welding Control is the subject of Bulletin GEA-4207 now available free from the General Electric Co., Schenectady, New York.

"How Business Engineering Benefits Business." Offered by the George S. May Business Foundation, 111 S. Dearborn St., Chicago 3, Ill., this eight-page report explains the various phases of business engineering as applied to all component factors of production, managing and marketing. Reading time, 22 minutes.

"How Accountancy and Engineering Share in Effective Tool Control" is the title of a six-page study published by the George S. May Business Foundation, 111 S. Dearborn St., Chicago 3, Ill., detailing and illustrating most effective methods of handling and conserving tool inventory through accounting and engineering cooperation. Reading time, 17 minutes.



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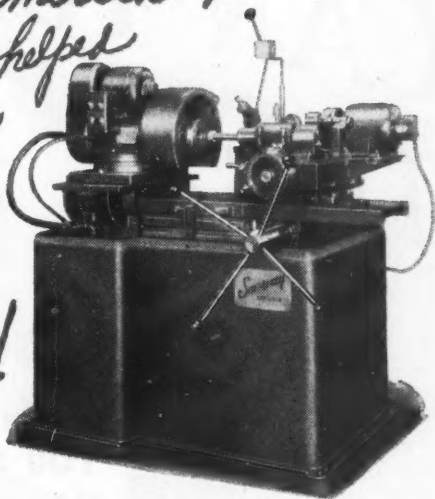
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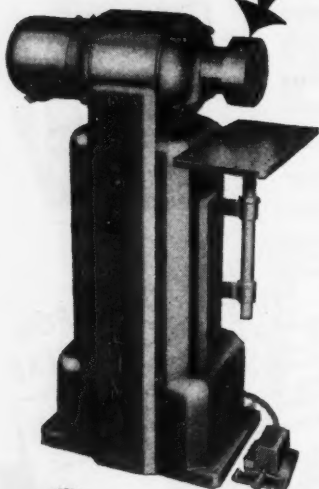
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Magnetic chuck holds ferrous metal parts from $\frac{7}{8}$ " up. This chuck, with the use of interchangeable face plates and register plugs, makes the Lima Magnetic Polishing Lathe a most flexible unit to rapidly handle various size parts in polishing, burring or lapping operations. Entirely magnetic, the chuck has ample power to hold material rigid and secure, making possible mirror finishes, without leaving chuck or collet marks to be polished out after main operations are completed. A self-contained rectifier unit supplies DC current to chuck.

In addition, the "Step-Release" foot pedal control of the motor and chuck, is another important LIMA feature which increases handling speed. This control allows the operator freedom of both hands to be used in placing, processing and removing work from the chuck.

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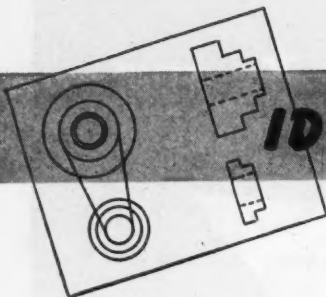
Five assembly plants (note right) provide quick servicing facilities for Producto Die Sets and Die Makers' Accessories. In addition stocks of Die Makers' accessories are carried in New York, Buffalo, Syracuse, Philadelphia, Dayton and San Francisco Sales Offices. Special Die Sets and Bolster Plates are made in and shipped from Bridgeport and Detroit.

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IDEAS FROM READERS

Arbor Adapter for Gear Cutter

(Courtesy General Electric Company)

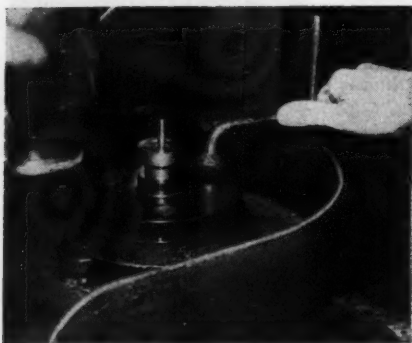
AN adapter devised at General Electric Company's Schenectady Works makes possible faster and more accurate positioning of the small arbors used in the cutting of small precision gears.

Formerly, when a "check-up" with a dial indicator showed that a gear shaper arbor was eccentric with the work spindle by more than 0.0002 inch it was replaced with a new arbor. Because there was no provision for spindle adjustment, much

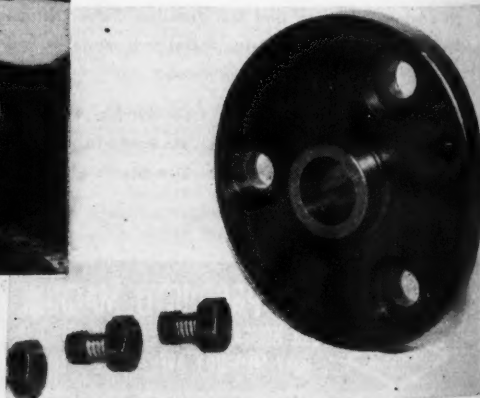
of a lathe operator's time was spent in making new arbors or remachining old arbors to bring them within the allowable amount of runout.

The adapter devised to eliminate this difficulty is bolted to the work spindle of the gear shaper. It is circular in shape, with a hub protruding from each face, and has tapered bore which conforms to the taper of all relative arbors. Three holes with ample clearance are provided for bolting the adapter to the spindle.

When an arbor is inserted into the adapter, a dial indicator is used to set it perfectly concentric with both the cutter and the work spindle. The adapter is then bolted in position and perfect accuracy in the gear cutting operation is assured.

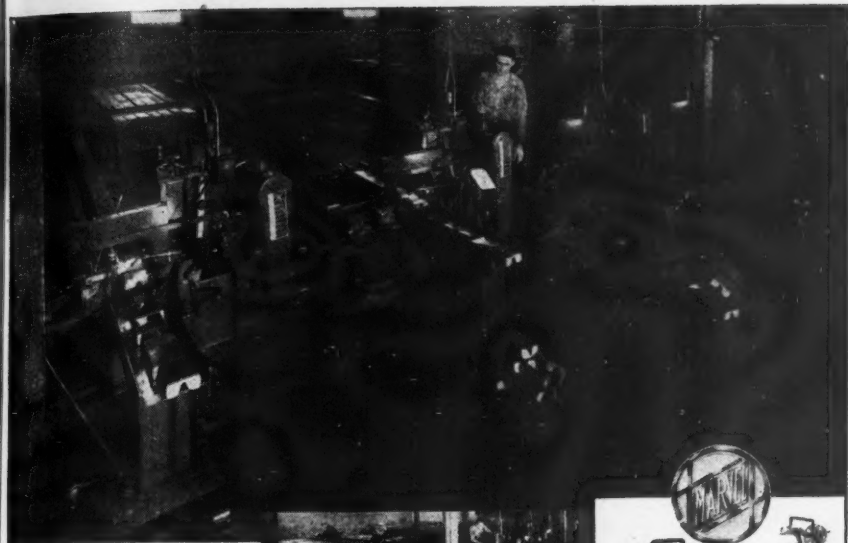


(Above)—Bolting Adapter to Gear Shaper Spindle. (Right)—Adapter for Accurate Positioning of Small Arbors on Gear Shapers, Devised at General Electric Company's Schenectady Works



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Endless Rows of Tank Shoes from saws that never stop.



These six MARVEL No. 6A Automatic Production Hack Saws, in the Louisville plant of the Service Welding and Machine Co., never stop except for necessary service—changing of blades, etc. Day after day on a 24 hours schedule they automatically cut 20 ft. sections of SAE 1020 Steel into multiple, 6 $\frac{1}{8}$ " lengths. This is "continuous high speed metal sawing at low cost," in fact.

Each of these pieces welded to a "Z" shaped forging makes a "shoe" for an Army Tank.

Before The Service Welding & Machine Co. took this contract they investigated various types and methods of "high speed production sawing" and selected MARVEL Production Saws as the most able and certain to deliver and maintain rapid, accurate production at low cost.

Write for Catalog showing the complete MARVEL System of Metal Sawing.

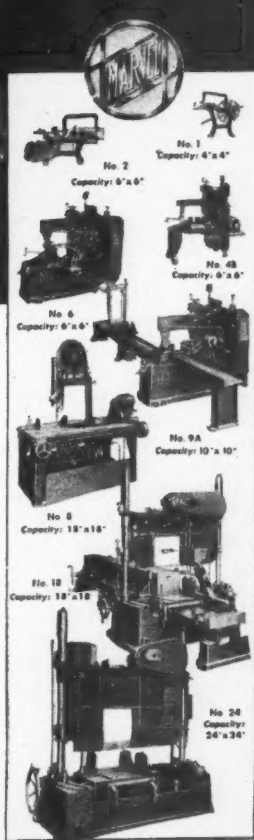
ARMSTRONG-BLUM MFG. CO.

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An Interesting Milling Job

By ROBERT MAWSON

THE job described here, involving the use of simple tools and fixtures for a radial milling job, seemed to the writer to be sufficiently interest-

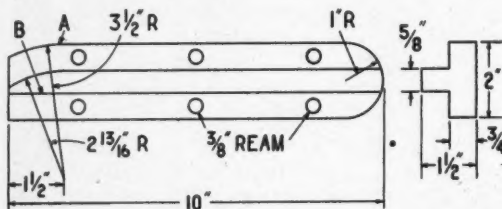


Fig. 1—Drawing of Workpiece Requiring Three Radii to be Finished

ing to be worth outlining for the benefit of others.

The job is to mill a $3\frac{1}{2}$ -inch radius and $2\frac{13}{16}$ -inch radius on one side of one end of the workpiece shown in Fig. 1 and a 1-inch radius around the opposite end. The piece is of machine steel, finished all over.

In order to hold the piece properly for machining, the fixture shown in Fig. 2 was made. The fixture consists of a cast iron base C upon which is mounted a circular table D carrying two cradles E and F. The circular table revolves around a center pin anchored in the base. Details of the cradles are shown in Fig. 3. The fixture is mounted on the table of a horizontal milling machine equipped with

a vertical milling attachment.

To mill the $3\frac{1}{2}$ -inch radius, the workpiece is located in the cradle E, Fig. 2. The clamp at the right end is swung into position and the thumb-screw is used to lock the piece against the setscrew in the left end of the cradle.

The cutter is positioned to produce the required radius, and the cutting action is produced by feeding the workpiece past the cutter by hand, using the handle H.

To mill the $1\frac{13}{16}$ -inch radius, the cutter used in the first operation is removed and replaced with a cutter that is 1.375 inch larger in diameter. Leaving the table in the

same position and feeding the table radially by hand as in the first operation, this operation is completed. The difference in the diameters of the cutters is correct for difference in radii.

The next operation is to drill and ream six $\frac{3}{8}$ -inch holes, which must be

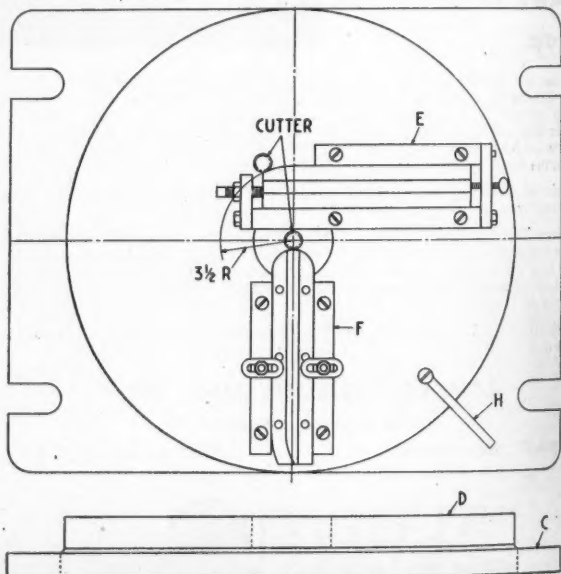
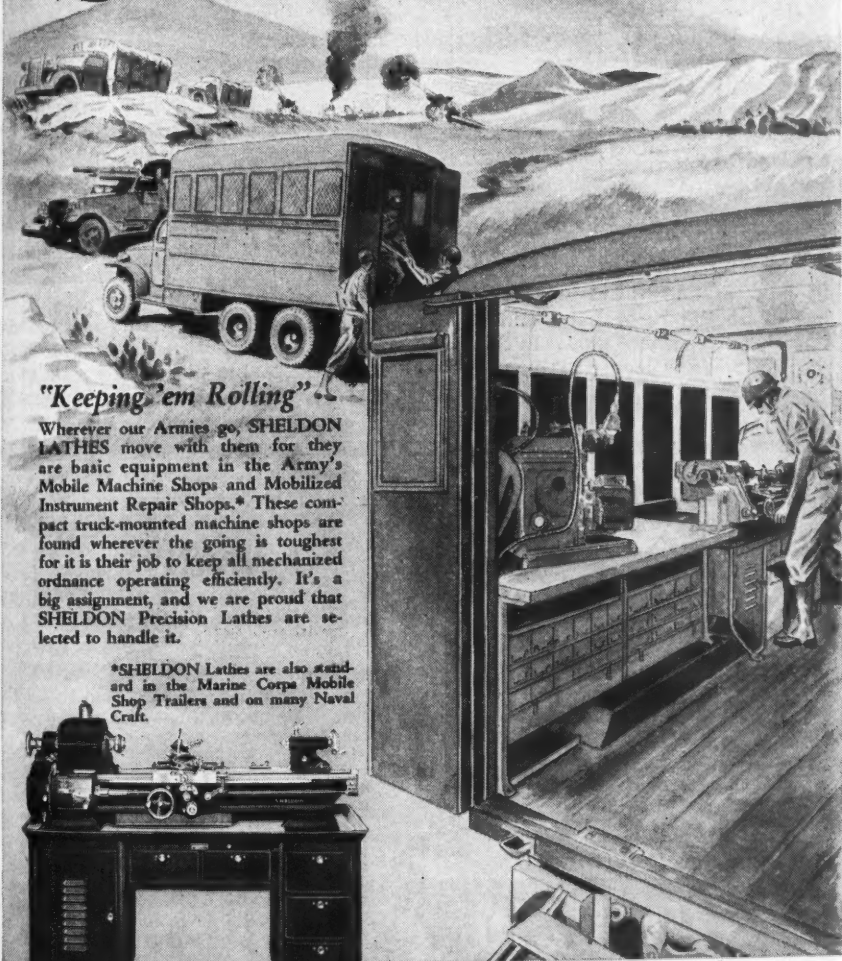


Fig. 2—Drawing of Fixture and Cradles for Milling Radii

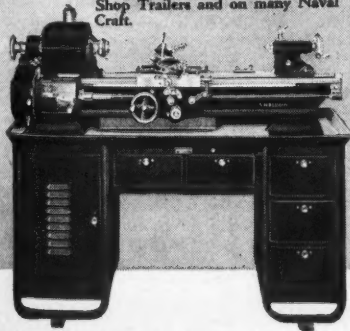
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Wherever our Armies go, SHELDON LATHES move with them for they are basic equipment in the Army's Mobile Machine Shops and Mobilized Instrument Repair Shops.* These compact truck-mounted machine shops are found wherever the going is toughest for it is their job to keep all mechanized ordnance operating efficiently. It's a big assignment, and we are proud that SHELDON Precision Lathes are selected to handle it.

*SHELDON Lathes are also standard in the Marine Corps Mobile Shop Trailers and on many Naval Craft.



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September, 1944

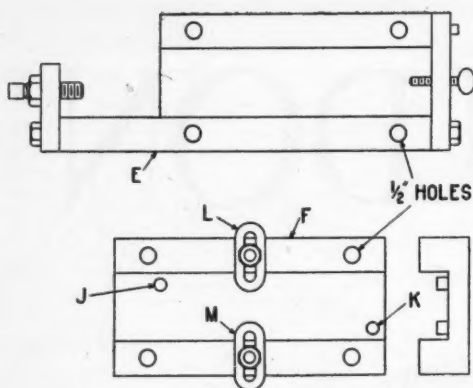


Fig. 3 — Drawing Showing Design of Cradles for Radial Milling

by the clamps L and M.

To obtain the correct radius the machine table is moved over until the center line of the table is centered with the center line of the spindle. Using a two-inch cutter, and feeding

in correct relation to the milled surfaces A and B, Fig. 1. The piece is then clamped in position in the cradle F, Fig. 2, and the 1-inch radius is milled at the right hand end of the piece as shown in Fig. 1. In this cradle the piece is located from the two $\frac{3}{8}$ -inch pins J and K, Fig. 3, and held

the table radially by hand, the correct radius is produced on the end of the workpiece at the correct distance from the other locating points.

By using the tools and method described here it was possible to produce acceptable pieces at a minimum cost for direct labor.

NEW BINS

for assembling small parts

Floors slope to feed parts to front — end reaching and fumbling.

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Rolled, smooth edges.

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to the nation's
leading industries . . .**

Abrasive RED BAND
DIAMOND TOOLS

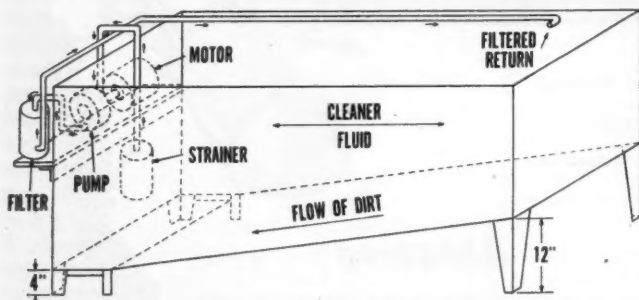
Abrasive
DRESSING TOOL COMPANY
Detroit, Michigan

Cleaning Tank Designed for Economy

By R. A. SHAW

IN the average shop where a cleaning tank is maintained for the cleaning of parts that are small enough to be dipped, the cleaning

the other, with the lower end dropping off into a deeper section for the collection of the dirt. At this end of the tank a pump is attached, with its motor, a filter, and a strainer. The strainer is located high enough to avoid the heavier particles of dirt which move down the incline and settle in the catch-pan at the lower end of the bottom.



Drawing of Cleaning Tank Equipped with Motor-Operated Pump and Filter

solution becomes dirtier with each lot of work that is cleaned until it finally becomes too filled with dirt for further use. The author presents here the design of a tank which, with a pump and filter, removes the dirt and foreign matter by continuous action, thus providing clean solvent at all times.

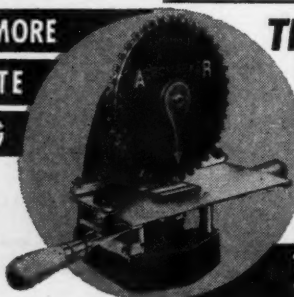
The tank is built so that the bottom is higher at one end than at

When the motor is in operation, the pump draws solvent through the filter, and finally sends it through a pipe located near the top of the tank with the discharge end at the opposite end of the tank from the filtering mechanism. Thus the solution is kept reasonably clean even where the tank is in continuous use, and if it is allowed to stand for a short time with the motor operating, practically all of the dirt will be removed from the solution.

Where any amount of cleaning is done, the savings made through the use of such equipment will very soon pay for it.

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Literature.*



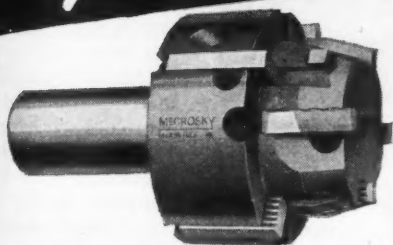
THE ACROMARKER

The No. 1 Model is especially suited for fast marking, numbering and lettering serial numbers, voltage indications, code letters, identification marks, manufacturers' key, etc. Easy to operate, the No. 1 Acromarker requires merely a swing of the handle to exert powerful screw pressure of the dies on the parts to be marked. Dies are automatically advanced for character spacing, and are replaceable.

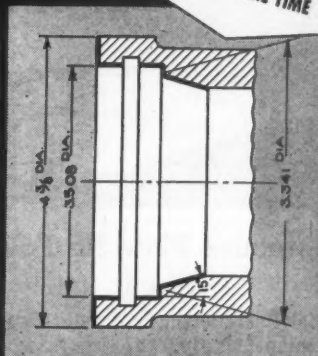
THE ACROMARK COMPANY

9 MORRELL STREET ELIZABETH, NEW JERSEY

McCROSKY *Specials*



Shown above: A special combination tool for taper boring, counterboring, and facing.



This one tool does
four operations
AT THE SAME TIME

cut machining TIME and COSTS

Some McCrosky "specials" are single operation tools. Others—like the example above—may combine 2, 3, sometimes 5 or more machining operations in a single tool,—thus shortening machining time,—and reducing production costs.

These tools employ McCrosky's exclusive, time-tested, patented blade locking, adjusting and locating devices. They are strong and rugged on the job... easily and quickly adjusted, reground or rebladed. They pay their way on short runs as well as quantity production... effect greatest possible economy and efficiency. Bulletin No. S-17 gives full details. Send for a copy.

THIS BOOK
GIVES FULL
DETAILS
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**COST
CUTTING
TOOLS**

McCROSKY TOOL CORPORATION

MEADVILLE, PA.

Designers and Manufacturers of

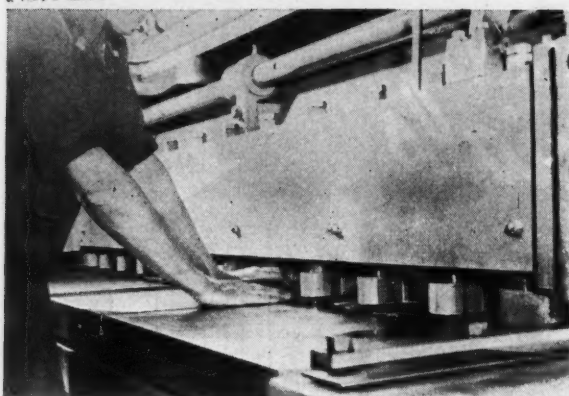
Jack-Lock MILLING CUTTERS

Black Type BORING BARS

Wizard CHUCKS AND COLLETS

Super Adjustable REAMERS

Turret TOOL POSTS



Power Shear Equipped with guard which keep Fingers Out of Danger Zone

Protective Plate for Power Shear

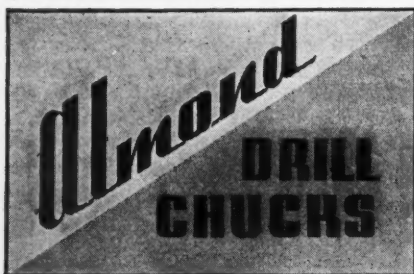
EVEN if the blade should drop unsuspectingly, the operator of a power shear will escape injury if the shear is equipped with a device invented by M. J. Telle of Goodyear

ried on with complete safety to the operator than was possible before the installation of the guard.

This particular guard is made of $\frac{1}{8}$ inch sheet steel metal which hangs behind a hold-down plate and is attached to the hold-down plate with flat headed screws. Thus the guard

Aircraft Corporation, Akron, Ohio.

The device is a protective plate which easily can be attached to the power shears, and is designed to permit fingers to be placed within a fraction of an inch of the blade with complete security. Thus a much more detailed operation may be car-

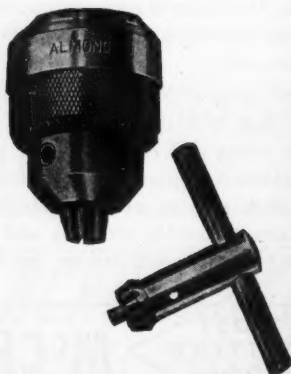


● The Almond Three Jaw Drill Chucks were the first to be placed on the market. They were Pioneers in the field of Drill Chucks!

ALMOND THREE JAW DRILL CHUCKS are furnished in 9 sizes with capacities from $\frac{3}{16}$ " to 1". These are made in heavy and light duty types with a taper arbor hole or with a threaded arbor hole. For Portable Drills.

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Helping Build the Ring of Steel Around Our Enemies!

As the tool that takes the first bite into metal for American armament, Progressive Shear-Cut End Mills are cutting faster, longer, and cleaner on the toughest jobs.

The Shear-Cut construction permits working to extremely close tolerances, minimizes chatter, and gives uniform cutting action. Feeding accurately, these end mills give adequate, rapid chip clearance . . . are precision made of the finest materials.

Progressive Shear-Cut End Mills are now manufactured by Siewek Tool Division of Domestic Industries, Inc. . . . the same high quality product with the *added* resources and service of Domestic Industries, Inc.

Specify "Shear-Cut" when you need end mills. Let them prove to you how precise a tool an end mill can be. *Write for catalog 5E.*

SIEWEK-BUILT PROGRESSIVE

SHEAR-CUT

END MILLS

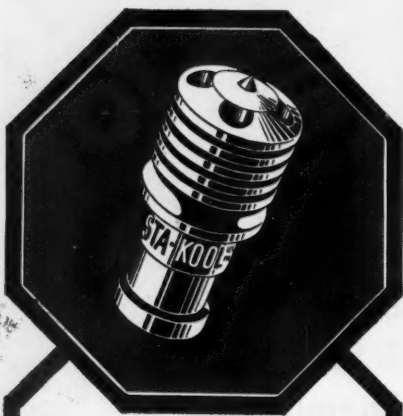
SIEWEK TOOL DIVISION

OF DOMESTIC INDUSTRIES, INC.
DETROIT (FERNDALE STATION) MICHIGAN



Distributors in
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Affiliated with Siewek Engineering Division—Chicago, Hartford, Conn.; and Springfield,
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STA-KOOL DIAMOND DRESSER

This new, patented diamond tool holder provides a fast, accurate method of meeting every requirement in dressing and truing operations. Equipped with internal coolant ducts for wet grinding, and external cooling fins for dry grinding, metal setting as well as stone are kept at safe operating temperatures, eliminating diamond breakage, due to overheating. Thus, tool life is increased, resulting in savings from 30 to 50%.

Catalog on request.



is held stationary while the hold-down plate moves.

To the $\frac{1}{16}$ inch sheet are attached 1/16 inch thick skirts which enclose the parts of the hold-down plate that come in contact with the material being sheared. The skirts assembly is adjusted to the proper height to allow for thickness of the material to be cut, but not high enough for the fingers of the operator to pass through.

Thus a double protection is assured, with the plate keeping the operator's fingers away from the blade and the skirts keeping the digits free of the hold-down plate.

Staggered Tooth Vertical Milling Cutter

By T. HAUG AND R. SMITH

Westinghouse Electric & Manufacturing Co.,
Philadelphia, Pa.

MILLING time has been reduced 40 per cent, cutter life has been increased, and regrinding and sharpening of tools has been considerably speeded up by the development of a new milling cutter at the Philadelphia Maintenance and Repair Department of Westinghouse Electric & Manufacturing Company.

A total of eight sintered carbide tools are mounted in an adapter to make a staggered tooth vertical milling cutter. The tools are not equidistant from the center, but rather are mounted so that each of the seven teeth following the first is set $\frac{3}{32}$ -inch closer to the center than the preceding one. Upon examination of Fig. 1 it can be readily seen that there is a pronounced difference between the distance from the edge of the adapter to the tool which the operator is checking, and from the edge of the adapter to the next tool on the right.

MAKE ONE BEARING OUTLIVE TWO!



One plant that regularly had two or three bearing failures a month writes us, "We have had only one bearing failure in five years since using LUBRIPLATE"... another writes, "Pulled our ball bearing temperatures down from 170° to 130 F"... still another, "If LUBRIPLATE cost \$1.50 a pound we could still afford to use it."

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6. LUBRIPLATE outlasts ordinary lubricants many times.
7. LUBRIPLATE is economical—a little goes a long way.

LUBRIPLATE is available in fluid and grease types for every need.



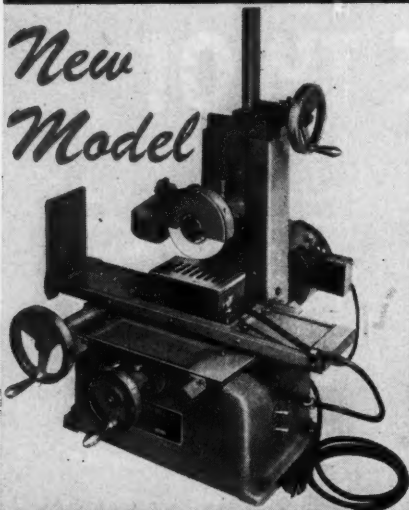
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THE MODERN LUBRICANT that Arrests Progressive wear

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The tools are also mounted in such a manner that each tooth projects out $1/16$ -inch more than the preceding one. Hence, each tooth cuts not only in a different vertical but a different horizontal plane as well. Slots in the adapter have a 10-degree angle that give a negative rake to the tool. Fig. 2, showing the depth of cut, illustrates the "steps" the cutters make as the adapter rotates.

Since its development some time ago,

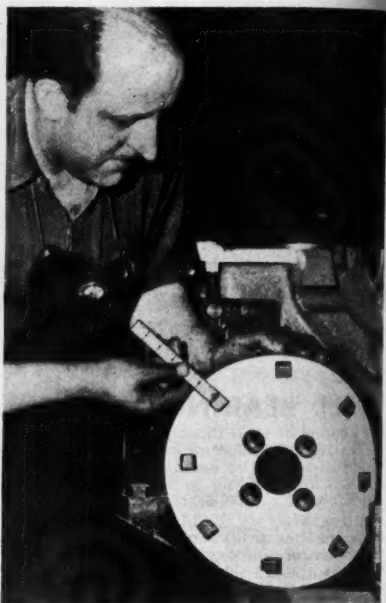


Fig. 1—Mr. Hoffman, one of the men responsible for helping to develop the special cutter, is shown checking the setting of the eight tools. Each of seven of the tools is mounted $3/32$ inch closer to the center and projecting $1/16$ inch farther than the preceding one.

this cutter has saved a considerable amount of machining time. This cutter removes eight times as much metal in a given time as the conventional cutter because it can take up to a one-inch cut whereas the ordinary milling cutter can, in most cases, take a

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The mark of a GOOD File

FORD—ace high in the field for twenty-five years—America's oldest manufacturer of rotary files—producer of the COMPLETE line. Write for catalog today.

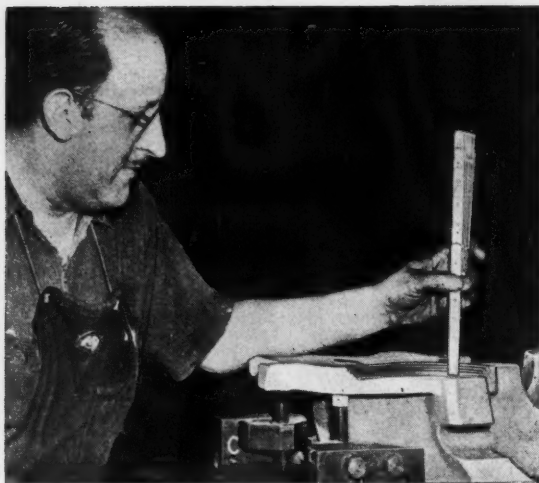
M. A. FORD MFG. CO., INC.

744 W. First Street • Davenport, Iowa

HAND CUT FILES • GROUND FROM SOLID CUTTERS • CARBIDE CUTTERS

September, 1944

MODERN MACHINE SHOP 223



Although the cutter can take up to a one-inch depth of cut satisfactorily, the usual depth is $\frac{1}{2}$ -inch. The photo also illustrates the "steps" the cutters make as the adapter rotates

arate teeth take only a $\frac{1}{16}$ -inch cut.

The individual cutters in this staggered tooth vertical milling cutter are tipped and run at quite high speeds. For example, one set-up was made to take an intermittent cut $\frac{3}{4}$ -inch deep on cast steel at 8 r.p.m. and with a one-inch feed per minute.

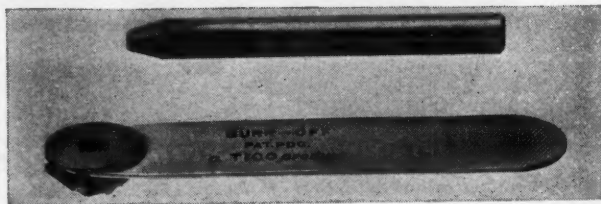
Another advantage of this new development is

maximum cut of only $\frac{1}{8}$ -inch.

Used chiefly for roughing and semi-finishing work, the usual depth of cut is $\frac{1}{2}$ -inch. In this case, the eight sep-

arate teeth take only a $\frac{1}{16}$ -inch cut. The individual cutters in this staggered tooth vertical milling cutter are tipped and run at quite high speeds. For example, one set-up was made to take an intermittent cut $\frac{3}{4}$ -inch deep on cast steel at 8 r.p.m. and with a one-inch feed per minute. Another advantage of this new development is that as the cutter requires sharpening, it is not necessary to remove the entire cutter head. Only the eight dull cutters are removed and a replace-

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EFFICIENT • DURABLE • SIMPLE • INEXPENSIVE

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THE CHOICE OF BETTER MECHANICS

Snap-on Tools
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Snap-on revolutionized nut turning with interchangeable sockets. No name in tools means as much in adding speed, precision and safety to every phase of production, maintenance, service.



SNAP-ON TOOL CORPORATION, 8032-1 28th Ave., Kenosha, Wis.

September, 1944

MODERN MACHINE SHOP 225

ment set installed; the time necessary to make this change is but five to ten minutes. Also, this naturally reduces the investment required since eight cutter tools take the place of a complete milling cutter. A complete set of eight cutters can be ground in about 15 minutes whereas to sharpen a typical milling cutter that would be used on the same type of work would require about four hours.

"Skymaster" Is A Whopper

Over a million rivets and more than three miles of wire go into the building—not a skyscraper—but of a Skymaster. That's the warplane flown by the Army Air Transport Command—the C-54 Skymaster, next in size of the Douglas family to the famed B-19, and largest land transport flying daily military schedules over all oceans and continents. It stands two stories high and has a wing span about equal to the length of an average house lot.

Welded together, the control cables

on this mammoth plane would stretch across the Mississippi at the mile-wide point between Missouri and Illinois.

There's over a ton of steel bar alone in the Skymaster's make-up. Add to that over a ton of steel sheeting, 2,290 pounds to be exact.

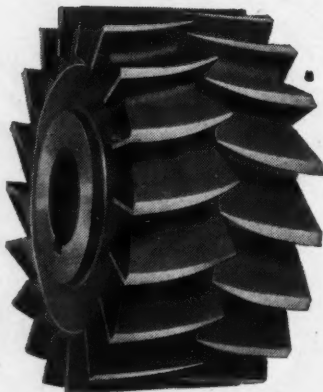
Everyone knows that the plane is made principally of aluminum, but who would dream that one plane requires over eight tons of the stuff.

Yet it also takes a lot of timber to build a C-54, for 1,197 square feet of plywood and 108 board feet of other woods goes into every transport.

Lighter, but just as important, contributors to the Skymaster's gross weight of up to 65,000 pounds are 250 pounds of magnesium, 120 pounds of plexiglas, 102 pounds of synthetic rubber and 544 pounds of aluminum tubing.

The giant plane that flies top priority supplies, troops and government leaders for Army and Navy across the Atlantic and Pacific and to all war zones is 93 feet, ten inches in length, over 27 feet in height, with a span of 117 feet, six inches. These transports are being built under War Department contracts in the Douglas Santa Monica, Calif., and Chicago plants.

Aber CURVED TOOTH Milling Cutters with "Chatterless Flowing Action"



Patented

- HIGHER SPEED (R.P.M.)
- LONGER CUTTING SURFACE
- LONGER LIFE

Types:

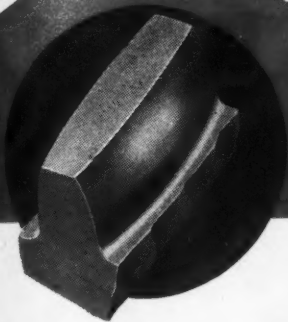
Plain Milling, Staggered Tooth Side Milling, RH or LH Half Side Milling, Overlapping Side Milling, Right and Left Hand Shear Side Milling and Woodruff Keyway Cutters. Cutters up to 14" Diameter.

Write for Literature

ABER ENGINEERING WORKS INC., WATERFORD, WIS.

Shaving Replaces GRINDING

FOR AIRCRAFT
ENGINE GEARS



A large motor company manufacturing the Pratt & Whitney Aircraft Engine has turned to gear shaving, according to a recently published article in American Machinist, for several reasons:

1. They find the quality of the shaved gear is equal or superior to the ground gear.
2. There are no burnt teeth such as may occur with grinding.
3. Shaved gears have a better final finish.
4. Dimensional tolerances can be closely maintained.
5. A gear which requires 40 minutes to grind can be shaved in 5 minutes.

Red Ring Rotary Gear Shaving corrects cutting errors of index, helical angle, tooth profile, eccentricity, and undesirable tooth roughness of gears from $\frac{1}{4}$ " to 96" P.D. On these machines the teeth of gears from $\frac{3}{8}$ " to 36" P.D. can be shaved to the ELLIPTOID form (crowned) to eliminate "end bearing."



WRITE FOR DESCRIPTIVE FOLDER ON RED RING GEAR SHAVING

NATIONAL BROACH AND MACHINE CO.

RED RING PRODUCTS

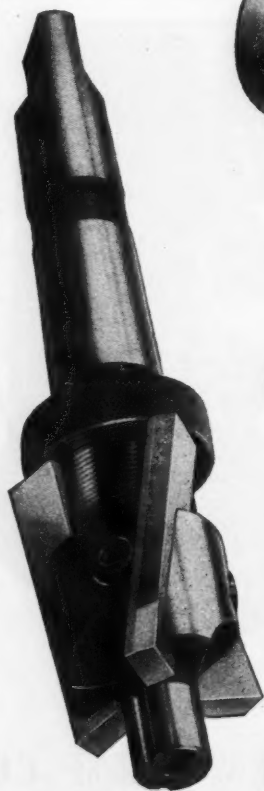
5800 ST. JEAN • DETROIT 12, MICH.

SPECIALISTS ON SPUR AND HELICAL
INVOLUTE GEAR PRACTICE

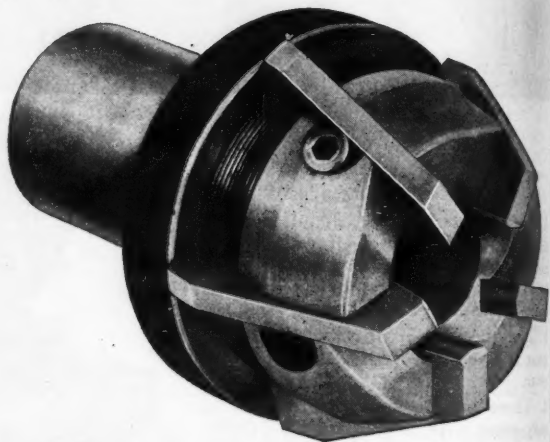
ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORMS



ADJUSTABLE HOLLOW MILLS



**Style H Facing and
Counterboring Tool**



Cut Cost—Increase Production

with GENESEE inserted blade—

**ADJUSTABLE HOLLOW MILLS
FACING and COUNTERBORING TOOLS
SPECIAL PRODUCTION TOOLS**

Backed by 35 years experience our Engineering Department is always ready to serve you in your Production Tool problems.

Write for complete Catalog No. 44-G

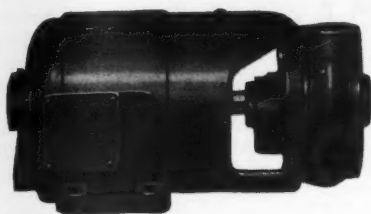
GENESEE MFG. CO.

ROCHESTER 4, NEW YORK

COOLANT PUMPS



BY-PASS VALVES



Model AG3M

PRECISION ENGINEERED

Built with utmost adherence to most rigid specifications . . . precision designed, built and inspected to insure exact performance. Countless tests prove the superiority of FULFLO PRODUCTS.

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FULFLO CENTRIFUGAL COOLANT PUMPS

Standard and special models . . . every one the result of experience in designing the best type for each purpose. Pipe sizes $\frac{3}{8}$ " to $1\frac{1}{2}$ ". Patented seal. Splash-proof, ball-bearing motors.

Write for the
Fulflo Mechanical Data Book.

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FULFLO BY-PASS OIL-RELIEF VALVES

NON-CHATTERING...no maintenance after installation; five different springs for pressure variation. Standard or flange models. Cast iron or brass bodies; brass, hardened or stainless steel pistons.



THE



Specialties Co., Inc.
BLANCHESTER, OHIO

News of the Industry

RECORD ADVANCE DISPLAY RESERVATIONS FOR METAL CONGRESS

Some 300 manufacturers and organizations serving the metal industry have broken a 26-year record for advance reservations of display space in the War Conference Displays and National Metal Congress. Scheduled for the week of October 16 in Cleveland's Public Hall, the Metal Congress is still months away but already larger than ever before.

"These heavy advance reservations reflect the cooperative spirit of the metal industry and its desire to come to grips with the problems that lie ahead," said W. H. Eisenman, managing director of the Congress and national secretary of the American Society for Metals.

"Many vital problems have been solved during the last three annual meetings, but the adjustments that confront the industry today can only be met by getting together to take stock of the advances that have been made in these war years.

"It is time," Eisenman continued, "to knit together the developments that have been made, to survey the present situation of the industry. For example, some sections of the metal industry may be converting at least a part of their production to civilian markets in the near future.

"These companies must get acquainted with the new executives, engineers and production men that occupy important positions in their field today. And on the other hand, these men must be familiar with what industry has to offer. Nowhere outside the Metal Congress is there a common meeting-place where this huge cross-section of the metal industry can get together.

"It is this desire to prepare—to get

ready for whatever faces us in the immediate months ahead that bring together these 300 manufacturers where they may meet with the thousands of metal men who have made the Metal

Congress their annual postgraduate course in metals."

The Metal Congress is sponsored by the American Society for Metals in cooperation with the American Welding Society, the Iron and Steel and Institute of Metals divisions of the American Institute of Mining and Metallurgical Engineers, the American Industrial Radium and X-Ray Society and the Society for Experimental Stress Analysis.

Technical sessions will be held each morning, afternoon and evening during the Congress with nearly a thousand metal experts collaborating in the preparation and presentation of some 150 lectures. In addition to the technical reports on research developments of the past year, the American Society for Metals will present a series of practical panel-type production meetings each afternoon and evening, with the exception of Thursday evening when the annual dinner will be held.

Two additional technical societies will participate this year. They are the Society for Experimental Stress Analysis and the American Industrial Radium and X-Ray Society. The Society for Experimental Stress Analysis has national headquarters at the Massachusetts Institute of Technology, with Prof. W. M. Murray of M. I. T. as president. Members of the executive committee are M. Hetenyi, Westinghouse Electric & Mfg. Co.; C. Lipson, Chrysler Corp.; and R. D. Mindlin, Columbia University.

During the Metal Congress the S.E.S.A. will have headquarters at the Carter Hotel, Cleveland. Technical sessions will be

In any spot — "Tight Spot" Experience



STAR PERFORMANCE!

All 4 sizes of DeMattia Molding Machines are powered by Star Motors to drive pumps creating pressure of 30,000 lbs. per in.

Providing motors for De Mattia Molding Machines is just another instance where Star experience gained in "tight spot" applications helps to take a load off designers and production engineers.

Without special castings, Star Motors match De Mattia requirements of size and power — thanks to welded construction. Without extensive revisions they are end-mounted, for convenience. Without special construction, Star Motors are adapted to reverse air currents and cool the DeMattia machine, as well as the motor itself. How can Star help you?



**POWER PACKAGED
AS YOU NEED IT**



STAR ELECTRIC MOTOR CO.
BLOOMFIELD • NEW JERSEY

MODERN MACHINE SHOP 231

September, 1944

held both morning and afternoon on Tuesday, Wednesday, Thursday and Friday, October 17 thru 20, with the annual dinner meeting on Thursday evening.

The American Industrial Radium and X-Ray Society will have technical sessions for mornings and afternoons on Thursday and Friday, October 19 and 20, with a special meeting of the Cleveland Section on Monday, October 16, and the annual meeting of the Society on Thursday afternoon. Convention headquarters will be at Hotel Hollenden.

The technical program of this Society is under the direction of Roy W. Emerson, metallurgist, Pittsburgh Piping & Equipment Co., Pittsburgh. M. B. Evans, Ternstedt Mfg. Div. of General Motors Corporation, Detroit, is president; Philip D. Johnson is secretary with national headquarters at 25 East Washington St., Chicago. J. A. Catanzano is treasurer.

The American Society for Metals will have headquarters during the Metal Congress at the Statler and the Hollenden Hotels; the A.I.M.E. will be at the Statler, and the American Welding Society at Hotel Cleveland.

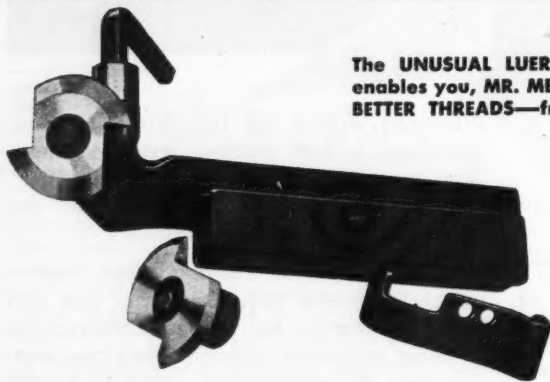
SEMI-ANNUAL MEETING AMERICAN SOCIETY OF TOOL ENGINEERS

At Syracuse, New York,
October 12, 13, 14, 1944

The American Society of Tool Engineers has announced its twelfth Semi-Annual Meeting to be held in Syracuse, October 12-13-14, 1944, with Hotel Syracuse as headquarters.

The vital need of extending up-to-the-minute information concerning methods of producing more and better war material and developing more and better equipment...of production capable of being operated efficiently by women and unskilled operators has caused the Society's National Executive Committee to decide that this meeting is not one of those falling within the scope of the request of the Office of Defense Transportation that "unessential conventions be cancelled."

National President D. D. Burnside, of St. Louis, points out that "failure to hold the Semi-Annual Meeting this year would break the continuity of the ef-



The **UNUSUAL LUERS** Patented Threading Tool enables you, **MR. MECHANIC**, to chase threads—**BETTER THREADS**—from 25% to 50% **FASTER**.

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Ask for a circular.

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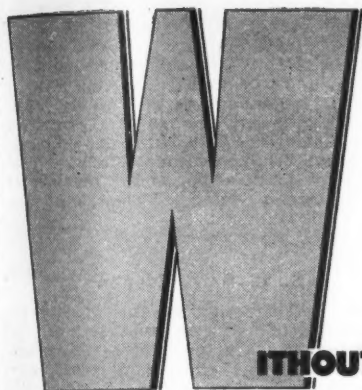
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WITHOUT QUALIFICATION, NORBIDE

**TIPPED ROYAL PURPLE* PLUG AND RING GAGES
ARE MORE ACCURATE OVER A LONGER PERIOD—
AND THEREFORE MORE ECONOMICAL THAN ANY
OTHER GAGES OF THIS TYPE...**



Norbide (boron carbide) approaches the diamond in hardness—yet this is but one reason for its outstanding qualities when used to tip plug and ring gages and other wear parts. Another reason is the fact that this material is non-metallic and therefore cannot charge. It cannot pick up lint, dust or metal particles that might scratch and scrap valuable parts.

Reports like this indicate user's enthusiasm—"measuring cost was 1/11th that of H. S. S." "275,000 holes plugged without showing measurable wear" "gage wore only .0001" after measuring 670,000 holes" "gaged over 500,000 grinding wheel holes—H. S. S. gages wore out after 3,000 holes."

A test of this perfect tipping material will convince you that the New England Royal Purple line of gages, contact points, anvils, etc. offers one of the most economical steps that can be taken by any inspection department.

*Royal Purple color is used on the steel shanks of all New England boron carbide products for quick identification.

Norbide—Trademark of Norton Co. Reg. U. S. Patent Office.

NEW ENGLAND CARBIDE TOOL CO.

45 BROOKLINE ST., CAMBRIDGE 10, MASSACHUSETTS

fective meetings held by the Society, particularly during the war period, when much valuable information has been presented at the technical sessions and carried to every part of the United States and Canada by word of mouth, as well as through the effective presentation of these subjects in the pages of the excellent technical journals of the North American continent."

The meeting of the Board of Directors, Thursday, October 12, will precede the Technical Sessions which will open at 10 o'clock Friday morning, the 13th, continuing through that evening, and Saturday morning and afternoon.

Past President Ray H. Morris, of Hartford, who is in charge of the program, announces that already arrangements have been completed for a discussion of "Magnesium Alloys" by representatives of Dow Chemical Company and others in the field of machining this metal and its alloys. "Operating a Branch Plant in Canada" will be presented by a group from the Dominion. "Tool Engineering Education" and other technical talks by outstanding representatives of industry are being scheduled as this story goes to press.

The Semi-Annual membership Meet-

ing and Dinner will be held in the Ballroom of Hotel Syracuse, Saturday evening, the 14th. Present indications are that attendance at this meeting will be limited to members of the Society. The dinner speaker, James Y. Scott, is President of the Van Norman Company, President of the National Machine Tool Builders' Association, and a member of the American Society of Tool Engineers.

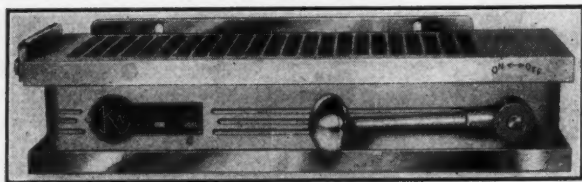
S. E. S. A. Meeting

The Fall Meeting of the Society for Experimental Stress Analysis will be held at the Carter Hotel, Cleveland, Ohio, October 17, 18, 19, 20, 1944, during the same week as the National Metal Congress.

Production Increased 42% by Use of Incentives

According to a statement issued recently by the War Production Board, a survey of wage-incentive plans in foundry and forge shops reveals that

KAR Permanent Magnet CHUCKS



Cannot Fail
Hold Work Tight
Generate No Heat

An outstanding and exclusive advantage of the KAR Permanent Magnet Chuck is its ability to hold smaller pieces securely due to the close spacing of the pole pieces.

Release Easily
Used Wet or Dry
Use No Power



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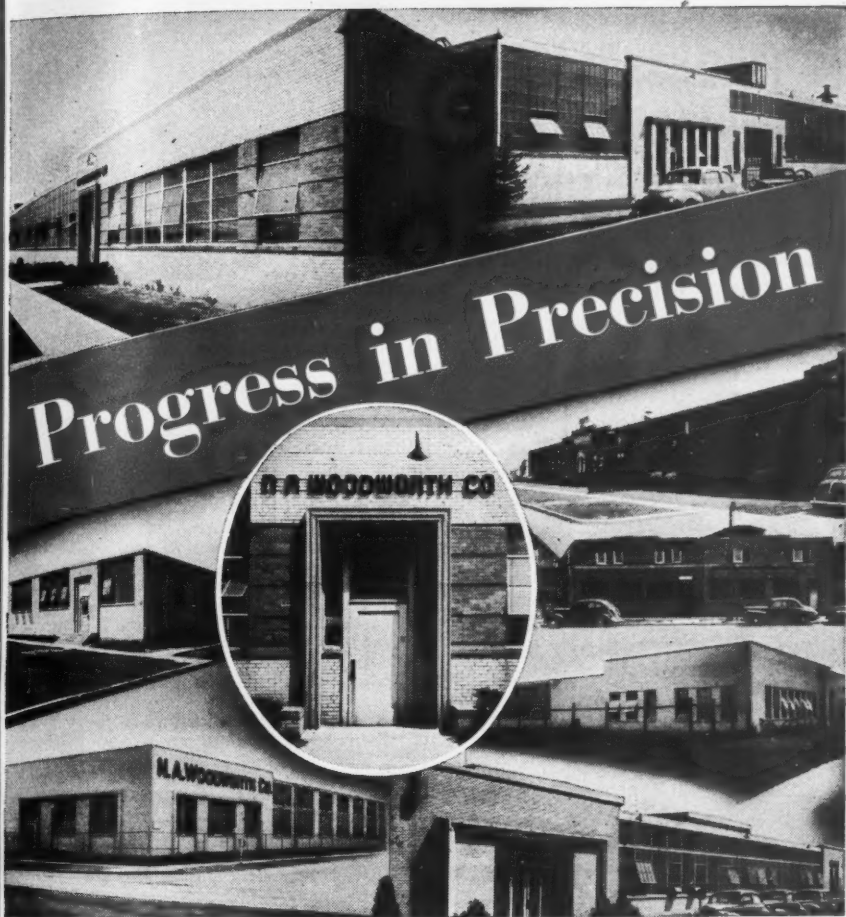
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WOODWORTH will give industry the means to build the finest peacetime products this nation has ever known. From the "know how" of its precision experience have come sound, workable advances in tool engineering that have already met the

critical test of war production during this great emergency.

Such progress in precision inspires confidence and it is from this point that Woodworth looks carefully at the job of giving industry . . . today and tomorrow . . . accuracy it can trust.

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PRECISION GAGES • GROUND THREAD TAPS • FORM TOOLS • PRECISION MACHINED PARTS • HEAT TREATING • PLATING

September, 1944

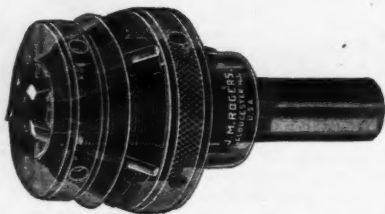
MODERN MACHINE SHOP -235

ROGERS PATENT ADJUSTABLE HOLLOW MILLING TOOL

now helping win its third war
and still going strong.



Circular on request.



Easily Adjusted. Rigidly Locked.
Rogers Built Since 1890.

**THE JOHN M. ROGERS
TOOL CORP.**
Gloucester City New Jersey

in 20 of these plants, production increased 42 per cent through application of the wage-incentive principle of "more work, more pay." These findings, reported by WPB's Management Consultant Division, indicated that all the plants have shown the same production gain as the 20 for which figures are complete, the effect of the wage-incentive plans should be equivalent to adding 7,000 men to the labor force in the 86 plants, WPB said.

The survey indicates that approximately 17,000 workers have increased their earnings 18 per cent through the wage incentive plans, while at the same time the foundries and forges shops have reduced unit labor costs by 12 per cent, WPB reported.

In 61.4 per cent of the 86 plants wage incentives were applied by management in cooperation with the American Federation of Labor or Congress of Industrial Organization. Of the remainder, eight per cent represents joint action by management and an independent union, while in 30.0 per cent of the cases no union was involved.

The survey covered wage-incentive plans of various types: Thirty per cent are based on individual performance. Fifty per cent are based on group performance. Plant-wide performance is the yardstick in 16.3 per cent of the cases. The balance of three per cent represents plans where production is measured on the basis of performance both by individuals and by groups.

The various plans are classified according to the basis on which the standard of production is set. In 26 per cent of the cases, standards have been set by time studies, while in 67.5 per cent of the cases, past performance is the yardstick. The remainder—6.5 per cent—are based on a combination of time studies and past performance figures.

Gemco Multi-Purpose Crank Shapers.—plain, production and universal types are illustrated and described in a four-page bulletin released by the General Engineering & Mfg. Co., 1523 S. 10th St., St. Louis 4, Mo. Lubrigard, an automatic safety feature which is said to protect GEMCO shaper against lubricating deficiencies, is also described and illustrated. In addition, specifications and dimensions of the various types of GEMCO shapers are listed. Copy of Bulletin GC-12 free upon request.

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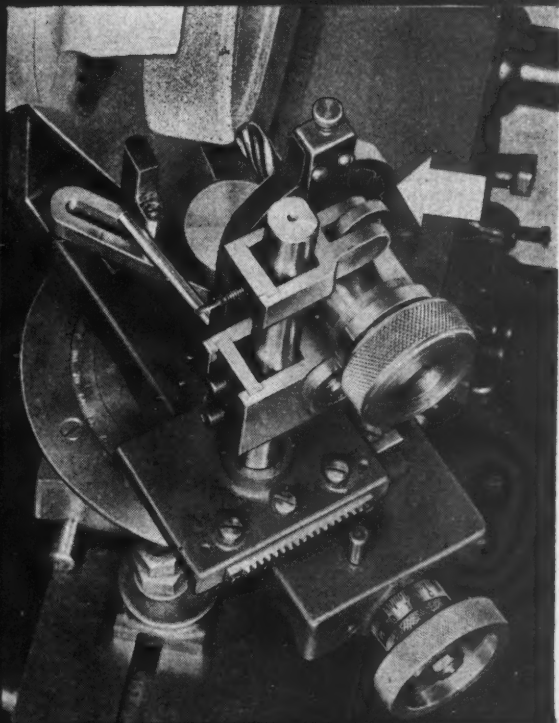
September, 1944

RADII ON END MILLS GENERATED

with MEYERS **Radiform**
TRADE MARK REG.

WHEEL AND TOOL FORMER

Meyers Radiform attachment permits generating of predetermined precision radii on spiral fluted end mills without previous wheel forming. Eliminates time and cost of forming wheels.



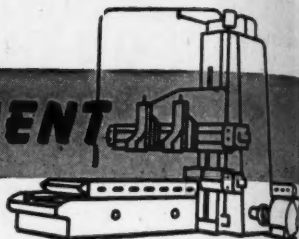
Other Radiform attachments available for supporting tool bits, milling cutters, die sinking tools and other forming tools to be generated directly against a grinding wheel.

Simple, sturdy construction of Meyers Radiform assures fast operation and long, trouble-free performance.

Write, Wire or Call Today for New Complete Descriptive Literature and Prices.

W. F. MEYERS COMPANY, Inc. • Established 1888
1014 FOURTEENTH STREET • BEDFORD, INDIANA

NEW SHOP EQUIPMENT



"Red Ring" GCQ-36-Inch Gear Tooth Shaving Machine

Designated as the GCQ-36-Inch, a precision gear tooth shaving machine for the finishing of both internal and external gears from 12 to 36 inches pitch diameter has been added to the line of "Red Ring" machines offered by the National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, Michigan.

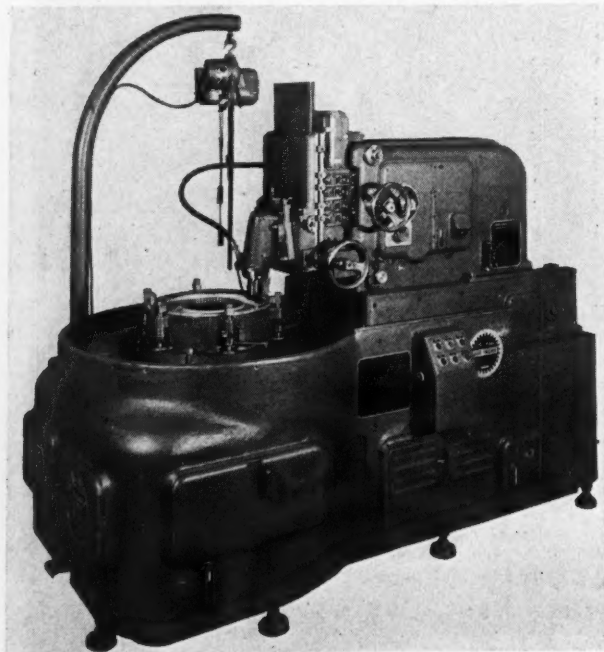
The principal rotary crossed axes shaving employed in the operation of the machine is the same as that around which other Red Ring finishing machines are built except that in this unit the work is carried horizontally on

a power driven rotary work table. The teeth of the work gear mesh with those of the cutter. The cutter, which is free to rotate, is driven by the work gear and at the same time is slowly reciprocated across the face of the work gear in a direction parallel to its axis. The cutter is fed into the work gear one increment at each reversal of direction in its reciprocating motion. Final work gear tooth size is controlled by the total amount of in-feed over the entire cycle.

To provide for quick and easy loading and unloading of work, the machine has been designed with no obstructions directly over the work table. The work can thus be lowered directly onto

the table, the surface of which is at a most convenient height. A power hoist is furnished as optional equipment to further facilitate the loading of heavy or bulky work. A self-contained hydraulic ejector controlled by a foot pedal at the table end of the machine serves to lift the work part out of its quick clamping fixture. It also serves as a loading platform for the subsequent work that is to be loaded.

The machine consists essentially of the previously mentioned rotary work table on which the work gear is located in a quick clamping fixture and a horizontal feed slide which carries on its forward end the cutter head with its verti-



"Red Ring" GCQ-36-Inch Gear Tooth Shaving Machine

cal cross feed slide. The function of the horizontal slide is to feed the cutter into the work; that of the vertical slide is to reciprocate the cutter across the face of the work.

Other features of the machine include a central push-button and selector switch control station located within easy reach of the operator. In connection with this station is an automatic counter which stops the machine at the termination of any predetermined number of strokes of the cutter head.

The cutter spindle is mounted in three zero precision anti-friction bearings and is designed for maximum rigidity with minimum overhang. The spindle may be adjusted axially through a total range of 40 deg. to obtain any necessary angle between the axes of work gear and cutter. A single knob at the operator's station controls the increment of in-feed at each end of a cutter head stroke.

Visual reference to the point at which automatic feed terminates is shown on a dial synchronized with the feed screw which actuates the horizontal slide. This dial also contains an adjustment reference marker to indicate the point at which the cycle is started.

A lever operated reverse gear provides for change in the relation of direction of feed and direction of table rotation. Power feed may be easily disengaged and the horizontal slide adjusted manually by means of a hand-wheel. A dial calculator conveniently located at the operator's station is used to determine instantly the operating speed of the work table and its relationship with the pitch diameter of the work gear and the desired cutting rate in surface feet per minute.

The hardened steel ways of both slides of the machine are pressure lubricated at regular intervals during the work cycle by an individual automatic lubricator. Oil to the drive gears, bearings, and other mechanism is furnished by a circulating pump system. All oil lines are concealed, thus assuring their protection from damage.

The electrical control panel is located in a separate compartment of the machine base, a hinged double door permitting complete accessibility. The disconnect switch is operated by a handle which is located outside the compartment and is interlocked with the door latches so that door is locked while power is on. The drive motor is also located in a separate ventilated compartment of the base, as is the coolant pump, chip container, and coolant tank.



WHEN IT'S *Versatility* YOU WANT!

- Grinding—Sanding—Rotary filing—Polishing—Wire brushing—Drilling—many other operations—all done with one Haskins Flexible Shaft Machine. And done better, too—and faster. This is no single operation machine. In every metal working plant, machine shop, foundry and die shop, there's no end of jobs for Haskins Equipment. Get the most from your man-hours. Write for Catalog 45, showing many ways to speed production with flexible shaft equipment. R. G. Haskins Company, 619 So. California Ave., Chicago, Ill.

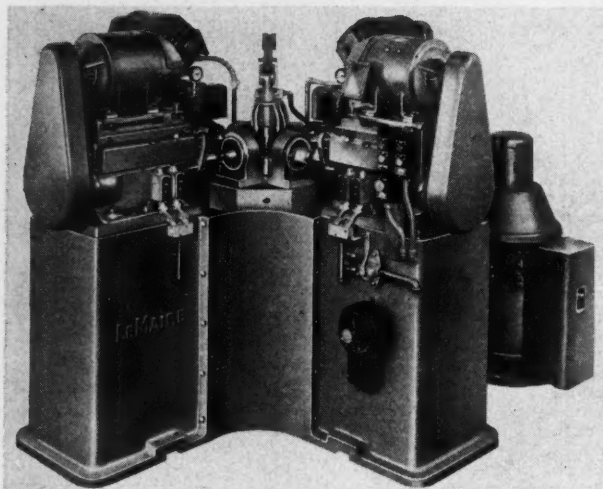


HC-5



haskins

FLEXIBLE SHAFT EQUIPMENT



LeMaire Four-Way Universal Machine

LeMaire Four-Way Universal Machine

Four standard end bases, each supporting a LeMaire twin ram hydraulic unit, have been bolted to a special center base to form a four-way universal machine which is now being offered by LeMaire Tool & Mfg. Co., 2650 S. Telegraph Rd., Dearborn, Mich., for hollow milling and facing universal joint spiders.

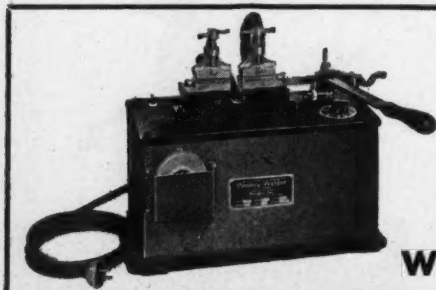
The piece to be machined is merely laid on center fixture where it is automatically locked and held firmly by air clamps while four spindles, operating at stations 90 deg. apart, machine the outside diameters and face shoulders of the four trunnions of the spider. The spindles are arranged with infinite speeds to machine various diameters.

Each spindle has a sleeve which rides on precision ball bearings. This sleeve is supported in bracket and held stationary while spindle revolves inside of it—arrangement which is said to eliminate gauling and possible chip trouble.

One press of control button provides for automatic activation of all four spindles through the following cycle:

rapid advance simultaneously, followed by feed, dwell, and rapid return. According to the manufacturer, production with the machine is approximately 100 pieces per hour at 100 per cent efficiency for a trunnion with $\frac{5}{8}$ -inch diameter, $\frac{3}{4}$ inch in length. Since the operation also provides for finishing the shoulder at the end of the cut, the tool momentarily dwells at that point to produce a smooth surface on the shoulder face. Production varies according to sizes of spiders machined.

The same type machine can be arranged for boring, drilling, reaming, and so on. In many cases, threading operations can be performed in same set-up. The machine can also be arranged to perform different operations at each spindle, using an automatic or hand index table in the center.



BAND SAW WELDERS

No. 141 may be had without grinder or with grinder for removing flash. Has 6 point heat control, one for annealing weld.

Welds saws $\frac{3}{4}$ " wide and smaller.

110 volt 60 cycle single phase. Can be made in 220 volt.

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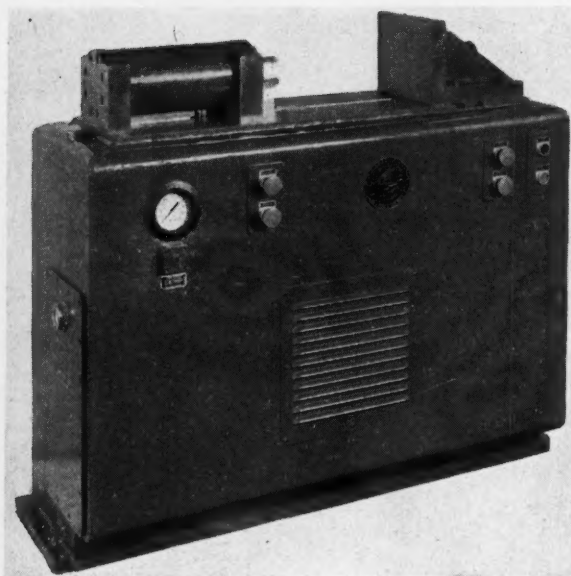
Precision Cylinders by Hannifin

Heavy duty lift trucks manufactured for the armed forces by Ross Carrier Company are also being built under license by Aetna Standard Engineering Co. The Ross Carrier lift truck design incorporates Hannifin precision hydraulic cylinders for both lift and tilt mechanisms. Hannifin cylinders are an exclusive no-tie-rod design providing a stronger, simpler, safer hy-

draulic cylinder construction. Cylinder bodies are bored and honed, providing a precision piston fit for full power and long life. Write for complete data, and find out the exclusive advantages of Hannifin design. For the most from hydraulic power, select Hannifin hydraulic cylinders. Hannifin Manufacturing Company, 621-631 South Kolmar Avenue, Chicago 24, Ill.

Hannifin

HYDRAULIC CYLINDERS



Barnes 5-Ton Hydraulically Actuated Horizontal Forming Press

Barnes 5-Ton Hydraulically Actuated Horizontal Forming Press

A unique hydraulically actuated horizontal press of 5-ton capacity has been placed on the market by the John S. Barnes Corp., 301 S. Water St., Rockford, Ill. Features of the machine include safety dual push-button control. Two push-button stations located 24 inches apart on the face of the press provide for positive control of advance and return motions of the ram. The ram is advanced toward the die holder when the "forward" button of each station is depressed and is reversed when

the "return" buttons are depressed simultaneously.

Hydraulic fluid moves the ram forward at a rate of 45 inches per minute and returns it with a speed of 90 inches per minute. Maximum pressure of the hydraulic system during forming is 800 pounds per square inch.

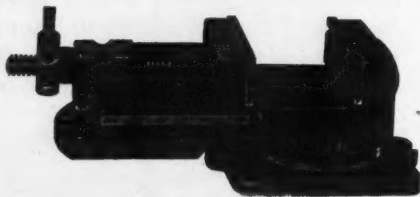
The working table of the press is readily accessible, being conveniently located at waist high level. A flange mounted dial pressure gage on the front of the machine, indicates the tonnage exerted by the forming ram. The hydraulic unit is compactly contained in the left end

of the machine, and a removable sheet metal cover on the rear of the base permits access to the working parts for necessary cleaning and adjustments. The electrical control panel, including transformer and disconnect switch, is at the right end of the base and is also easily accessible.

Hanchett No. 100 Rotary Surface Grinder

Designed especially for high speed, high capacity production, a five spindle rotary surface grinder, designated as

GEM DRILL PRESS AND MACHINE VISES...



Modern Vises for Tool-room and Production. Sizes ranging from 3" to 10 1/4" opening. Strong, Versatile, Quick-Acting. Pay for themselves in time-saving.

Write for circular describing entire line of GEM MACHINE VISES.

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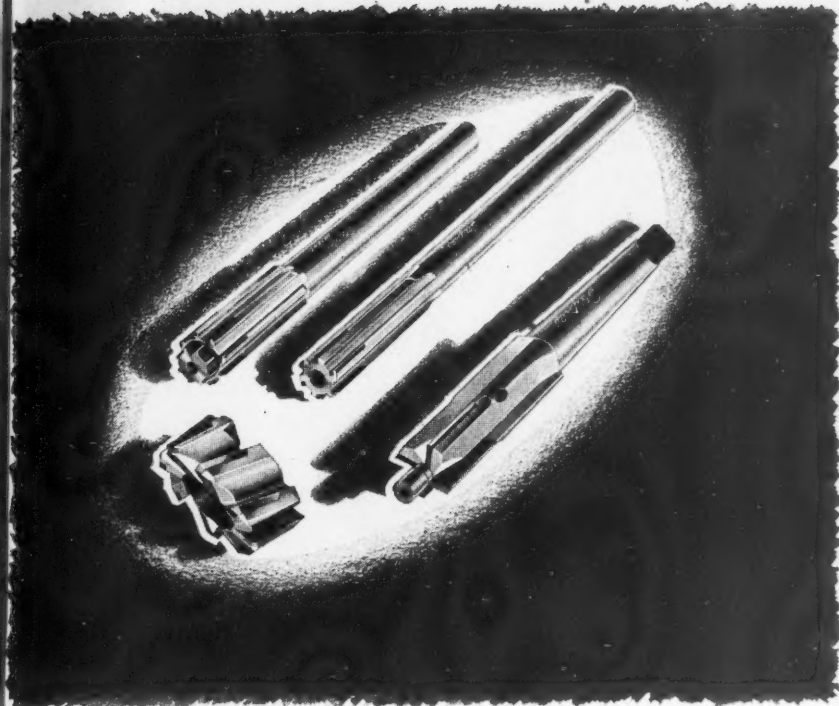
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NOW ... *AIRCRAFT ACCURACY* IN CUTTING TOOLS...FOR ALL

Since Staples was founded most of its output of Carbide-Tipped Circular Cutting Tools has gone into the building of aircraft engines. In fact, more Staples Carbide-Tipped Reamers than all other makes combined are used by aircraft engine manufacturers.

Now, greatly increased production facilities make it possible for you to enjoy the benefits of these tools, made to meet the needs of aircraft accuracy. No matter what industries your

products serve, you can make use of today's highest quality cutting tools.

Our line of standard design tools is complete, but we will also make special design tools to your specifications.

Send for the most comprehensive information published on reamer usage and design, contained in our Catalog No. 44.

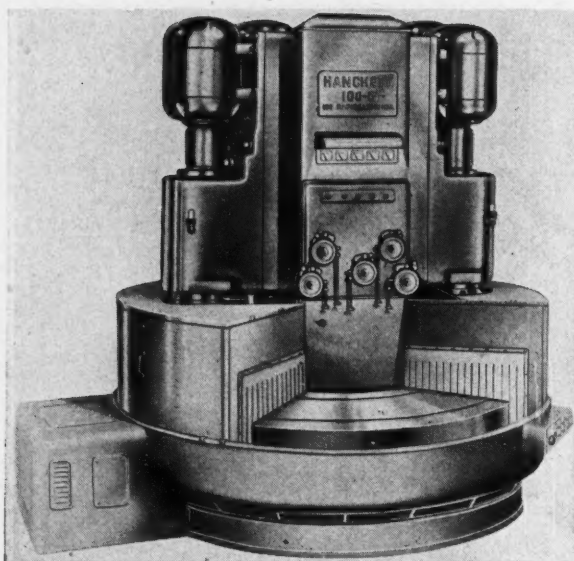
STAPLES TOOL & ENGINEERING COMPANY
CINCINNATI 25, OHIO

Staples CARBIDE-TIPPED CIRCULAR CUTTING TOOLS

REAMERS • CORE DRILLS • SPOT FACERS • COUNTERBORES • END MILLS •
SHELL END MILLS • ALSO A COMPLETE LINE OF CIRCULAR SPECIAL TOOLS

September, 1944

MODERN MACHINE SHOP 243



Hanchett No. 100 Rotary Surface Grinder

coarse grain; the fourth wheel, fine grain; and the fifth wheel, or finishing wheel, of a rather fine grain. Variations in the grain numbers can be made to fit the job.

The Hanchett No. 100 Rotary Surface Grinder is equipped with a wheel dresser for each wheel head, and each wheel head is provided with a built-in ammeter so that the action of the grinding wheels can be easily observed. Standard equipment of the machine includes floodlights, guards, and coolant system. The entire machine weighs approximately 55,000 pounds.

the No. 100, is now being introduced by the Hanchett Mfg. Co., Big Rapids, Mich. The machine is equipped with a T-slotted work table 100 inches in diameter by 20 inches in width, and is driven through a P. I. V. variable speed unit by a 5 h. p., 1,200 r. p. m. motor.

Each of the five grinding wheel heads of the machine embodies a 40 h. p., 900 r. p. m. motor, making a total of 200 h. p. for grinding wheels. Each grinding wheel head is fitted with an automatic sizing device which automatically compensates for wheel wear and operates in increments of 0.0002 inch.

The first three grinding wheels, or stock removing wheels, are usually

Wood Sectional Flanging Press

The accompanying illustration shows a hydraulic sectional flanging press designed for 1,500 lb. per square inch working pressure which has been completed by the R. D. Wood Co., Philadelphia 5, Pa. Enclosed within the three-piece heavy welded steel plate frame of the machine are two 10-inch tension columns which carry the full stress of the working load.


The press is provided with two 6½-inch diameter vertical main rams, a 14-

"OUTWEARS

the best

Bronze Metal"

20 years



without
a drink—

ARGUTO

OILLESS BEARING CO.

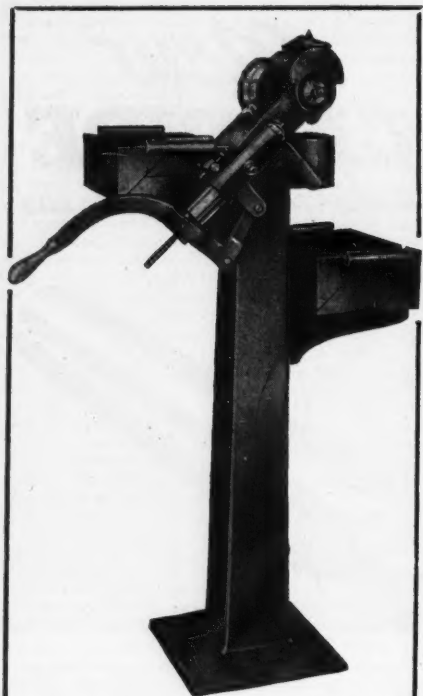
Wayne Junction, Philadelphia, Pa.

ber. 1944

Attractive deliveries can be made on Planco High-Speed Steel Thread and Form Milling Cutters.

For increased production with maximum savings in time, money, and manpower—tool up today with Planco Carbide Thread Milling Cutters!

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SCREW HEAD SLOTTER

$\frac{1}{8}$ " to $\frac{1}{2}$ " Screw Body Diameter.
Will not injure screw threads.

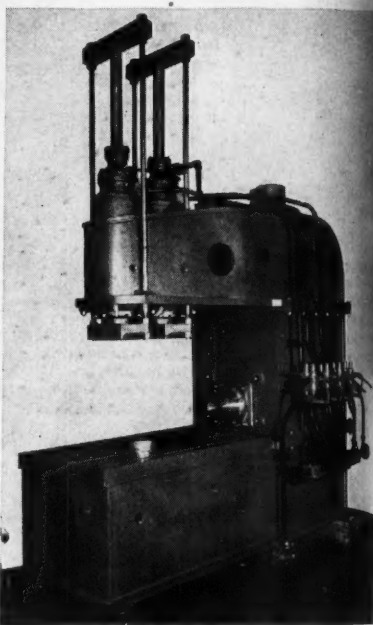
**Easy to Operate
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Write for Bulletin

JOHN B. STEVENS INC.
482 CANAL ST., NEW YORK 13, N. Y.

inch stripper ram, and a $15\frac{1}{2}$ -inch double-acting horizontal ram. Each of the main rams has a maximum travel of 30 inches and a maximum capacity of 150 tons. All operating valves are arranged in pulpit form so that the two vertical main rams may be operated separately or together in order to provide a total capacity of 300 tons. The horizontal ram and stripper ram



Wood Sectional Flanging Press

each have a stroke of 24 inches and a capacity of 115 tons.

The Wood Sectional Flanging Press is provided with a maximum daylight opening of 45 inches and is constructed with an 8-foot wide table which has four T-slots (machined from the solid) running from front to back and is machined for insertion of stripper cylinders.

Colonial "Junior" Hydraulic Press

A "Junior" hydraulic press which is available in capacities of 1, 2 and 4 tons, in both bench and pedestal types.

★ HELPING AMERICA PRODUCE MORE! ★

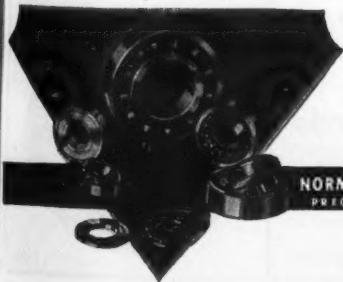


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★ They're out on America's "production fronts," giving freely of their highly specialized experience, assisting manufacturers of armament, equipment, munitions and supplies in keeping production lines moving. They're aiding **MACHINE BUILDERS** to apply anti-friction bearings more economically and efficiently. They're helping **MACHINE USERS** to get the most from the bearings they have—to lengthen their life—to reduce shut-down hazards. At our factory, The Engineering and Research Departments are equally busy, solving problems in bearing application, operation and maintenance submitted by buyers of bearings in every field. And all this service is being rendered without cost, **THAT AMERICA MAY PRODUCE MORE.**

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PRECISION BALL AND ROLLER BEARINGS

BUY MORE UNITED STATES WAR BONDS, TODAY

September, 1944

MODERN MACHINE SHOP 247

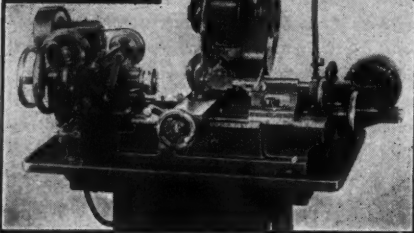
has been brought out by the Colonial Broach Co., Detroit 13, Mich. Design and operating characteristics of the machine are said to be such as to provide a high degree of flexibility for general shop use or for conversion from one form of operation to another. Thus, the press may be used for assembly work, push or pull broaching, and may be converted from bench to pedestal type or vice versa.

Two-unit construction is used in the pedestal type. The upper unit is the bench type press which is rigidly bolted to a reinforced base to form the ped-

WALTHAM Thread Miller

For threading small parts. It will cut V, N.S., Acme, Whitworth and Metric threads, special threads. Special head for internal threading is shown in insert at left. Special head for relieving can also be furnished. Send us drawings or samples and we will gladly submit our suggestions, no obligation. Also makers of Small Milling Cutters, Sub Presses, Pinion and Gear Cutting Machines. Write for illustrated bulletin.

Waltham Machine Works
Waltham • Mass.



Colonial 2-Ton Bench Type "Junior" Hydraulic Press equipped with variable speed control, pressure regulator and pressure gage for sensitive assembly operations

estal type. Platens are counterbored concentric with the ram, thus permitting ready installation and locating of fixtures in line with the ram movement of the machine. The base below the platen is slotted and relieved to permit ready use of the press for assembly work. The sides of the slot are machined in relation to the axis of the ram to equalize clearance for fixtures

Produce with SAFETY!

It pays to protect your operators by equipping your punch presses with

STRAND Enclosure Safeguards

Easily installed. Adjustable to any size die. Quickly changed for any set-up. Write for circular.

STRAND MFG. CO., INC.

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Chicago 6, Ill.



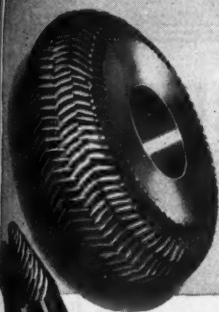
INTO TIGHTEST CORNERS



The RFC HAND-CUT ROTARY FILE of "knifedge" design—shown above—is cleaning burred teeth on a sewing machine foot punched from steel.

Another RFC file removes burrs from rings where a three-cornered scraper otherwise would have to be laboriously used. And still another will penetrate wherever a tiny pencil can be thrust!

No matter how inaccessible the place that needs cleaning up, some RFC type is pretty sure to be able to get at it . . . and to do a precision job—with fast, clean, smooth cutting.



Designing such ingenious rotary file shapes is a routine matter for RFC specialists. They've had some 20 years' experience in getting rotary files into the plants and corners where they are needed most.

Write for your new RFC Catalog. Study it carefully. May save you a lot of production headaches . . . plus operators' time, labor and fatigue.

The ROTARY
FILE COMPANY
STRATFORD, CONN.

on both sizes. Ample daylight and stroke are provided so that fairly large work can be handled.

Direct-drive electric motors are vertically mounted in the column of the machine to furnish power for the hydraulic operating mechanism. Motors are designed for either 50 or 60-cycle operation. Stroke of the machine is easily altered by changing position of the stop collars. The machine can be arranged to stop at both top and bottom of each stroke or to stop at the top only, with automatic return to the bottom.

For broaching, the pedestal type Junior hydraulic press is available with a large coolant reservoir fitted with chip strainers. Chips are readily removed through a door in the front of the base. A centrifugal type coolant pump is externally mounted on the rear of the base where it is direct driven by individual motor.

When it is desired to perform pull-broaching operations on the press, platen is bored and provided with long bushings, platen design being such as to anticipate this possibility. These bushings then serve as guides for the hardened and ground yoke guide rods which extend into the base of the ma-

chine, the yoke being provided with a broach puller at the lower end.

Normal ram speed of the machine is 30 feet per minute (15 feet per minute on the 4-ton type). Speed, however, is readily adjustable to any rate below this with an accessory control available with the machine. Other special accessories designed for the Junior hydraulic press include a variable pressure control and a pressure gage, as well as dual controls which are so designed that both of the operator's hands must be on the controls to start the machine.

Struthers Wells Tangent Bender

The Struthers Wells Tangent Bender shown herewith, product of the Struthers Wells Corp., Titusville, Pa., is said to be unique in its ability to edge bend sheet metal in the lighter gauges. According to the manufacturer, tangent bends in many convenient forms can be produced cold in one operation of the machine, the metal being smoothly upset so that no further finishing is required.

Although primarily designed for edge

LEACH EXTERNAL GRINDER

\$875.00

**A Proven
Product for Over
a Quarter Century
with Thousands
in Use Daily**

Fully Equipped

Grinds work from $\frac{3}{4}$ "
to 11" in length and
from $\frac{1}{8}$ " to 7" in dia.

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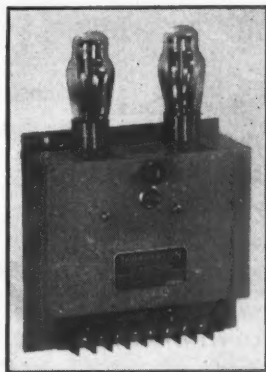


PRECISION
in all types of
CONTROL
by means of
FLASHTRON
THE HEART OF MODERN ELECTRONIC CONTROL

For manufacturers of machinery... for manufacturers of varied types of products where extreme accuracy of control is highly desirable—for instance, stopping a machine within 1/10,000 th of an inch—Flashtron opens new vistas of electronic control.

Requiring only very small energizing currents, Flashtron provides precision control by the most minute movement of contacts. Instantaneous reversible control may be had with Flashtron since its output circuits accommodate motors, solenoids or other power control devices.

Control manufacturers, as well as users, will be sent the complete Flashtron story on request.



Model T-50 x 40

Power Source—115 Volt 60 c. p. s.

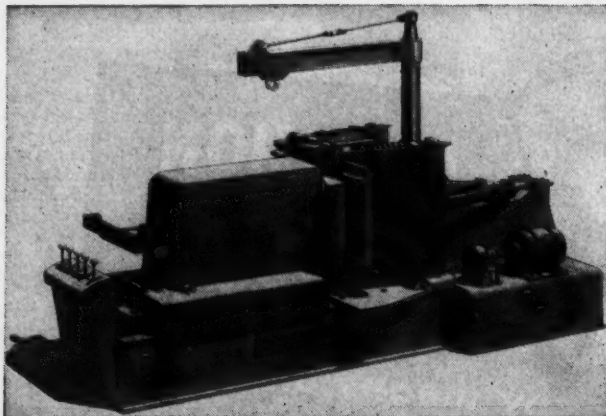
Control Circuit—Operation of one pair of contacts produces orientation of power output.

Output—Two circuits supply 115 Volts up to 40 V. A.—Only one output circuit functions at any given instant. Other sizes available, special order.



CONTROL DIVISION

THORDARSON ELECTRIC MFG. CO., 500 W. Huron St., Chicago 10, Ill.



Struthers Wells
Tangent Bender

beveling, the Struthers Wells Tangent Bender can also be used as a horizontal 50-ton press for blanking, piercing, forming, embossing, and many other continuous operations. Features include welded steel construction, self-contained hydraulic unit, independently controlled forming wings, large die backup support, quick-change radius gears, over-

pressure, 50 tons; stroke of main ram, 10 inches; swing of radius bending wing, 109 deg.; maximum centers, double bends, 34 inches; minimum centers, double bends, 17½ inches; die space, 19 x 24 inches; die opening ram back, 21½ inches; length of straight angle bends, 52 inches; control, hydraulic; motor horsepower, 5; main

size swivel post ram, long ram carriage, load carrying wedge for swinging carriage, hold-down lock for swinging carriage, extra long gib liners, extra heavy die plates, extra large die space, main ram anti-lifting lock, enclosed oil reservoir, and crane for handling dies.

Specifications of the Struthers Wells Tangent Bender are as follows: main ram

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THREAD RINGS
PLAIN PLUGS
PLAIN RINGS
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PROFILE
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CONCENTRICITY
JIGS and
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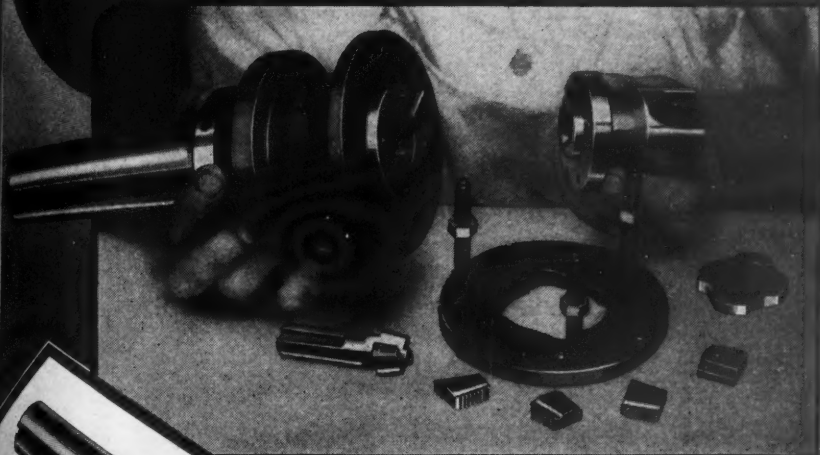
DETROIT 21, MICH.

Announcing *Murchey*

THE NEWEST ACHIEVEMENT BY

15 Threading Sizes in Only 2 Tools

TYPE L COLLAPSIBLE MACHINE TAP



Showing
Chaser Bearing
on Pin

Murchey also manufactures all types of Collapsible Taps, Self Opening Die Heads and Tapping Machines. Write for literature on any of these products.

NEW MECHANICAL FEATURES

Separate nose pieces and two bodies provide threading ranges of $1\frac{1}{8}$ " to 6" in diameter. 15 sizes in all—8 for smaller—7 for larger. Simplified design. Single centralized spring. Fewer pieces. Chasers mechanically stronger. Bearing surface 100% on the pin.

ADVANTAGES OF TYPE L

Flexibility. Better alignment—straighter threads. Greater dependability—trouble-free performance... longer life. Can be used on machines with or without lead screws. Tripping mechanism may be operated from face of the work or by the use of a yoke. All exposed surfaces treated with penetrating rust-proofing process.

Write for Complete Information to Dept. N

MURCHEY MACHINE & TOOL CO.
DETROIT 26, MICHIGAN

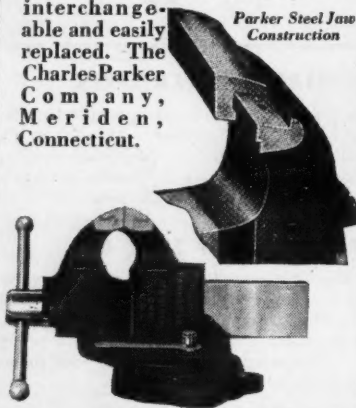
MURCHEY



WITH "GLOVES ON"

The tool steel jaws of the Parker Vise hold delicate work firmly, yet carefully. For the extra-hard, even surface of these jaws eliminates marring that comes from chipped, uneven jaw faces. For added protection, the entire top of the Parker Vise is covered with tool steel. Jaws are interchangeable and easily replaced. The Charles Parker Company, Meriden, Connecticut.

Parker Steel Jaw Construction



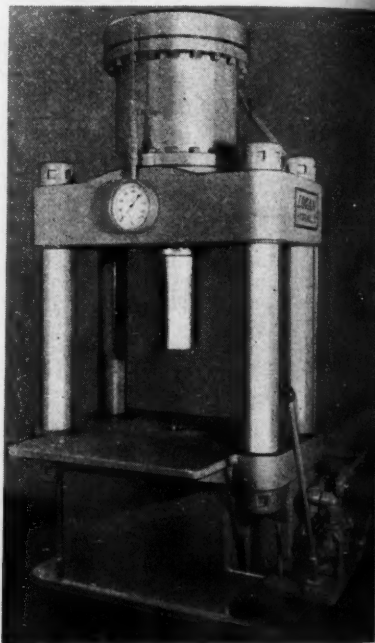
PARKER VISES

America's Oldest

space, 52 inches wide x 177 inches long; height over machine, 66 inches; height over crane, 96 inches.

Logansport Special Four-Poster Hydraulic Press

Featuring a maximum ram opening of 30 inches and 15-inch stroke, a special four-poster tie rod type hydraulic



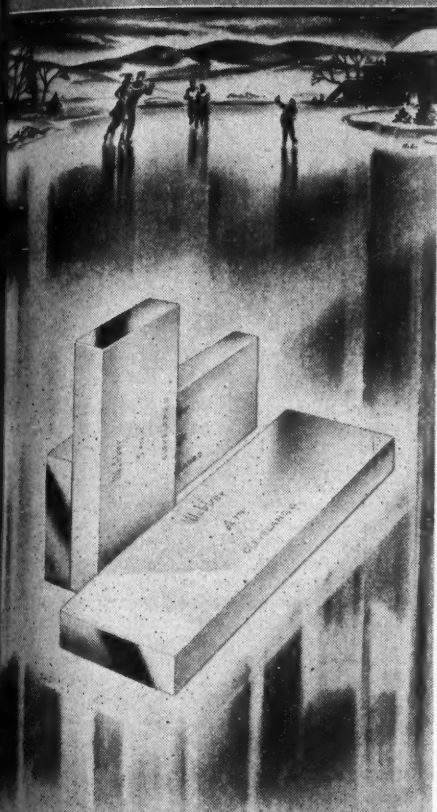
Logansport Special Four-Poster Hydraulic Press

press which can be readily adapted to a wide variety of heavy forcing and forming operations has been built by Logansport Machine Co., Inc., 901 Payson Rd., Logansport, Indiana.

A dual volume hydraulic pump provides for low pressure operation during the nonforcing portion of the operating cycle and high pressure application during the actual forcing portion of the cycle. The change over from one to the other is accomplished automatically as demanded by the resistance to the

SURFACE FINISH

ONE OF THE 5 THINGS
TO LOOK FOR WHEN
YOU BUY GAGE BLOCKS



*Look for these 5 things when
you buy Gage Blocks -*

- | | |
|---------------------------|--------------------|
| 1. Dimensional Accuracy | 3. Surface Finish |
| 2. Stability | 4. Wearing Quality |
| 5. Service after the sale | |

● Surface finish is of vital importance in gage blocks because

1. It provides maximum accuracy of working surfaces.
2. It reduces wear. A rough surface composed of ridges and valleys wears rapidly when rubbed against another such surface.

THIS wears faster than THIS.



3. It provides easier handling. Blocks can be "wrung" together more easily and cling harder.

Webber Gage Blocks have the finest surface finish which it is commercially possible to put on steel. This finish is obtained by methods and equipment developed by Webber technicians over a period of many years for their exclusive use in finishing Webber Gage Blocks. Inspection of the finish of Webber blocks is done on the most modern, improved, sensitive surface testing equipment.

No Webber Gage Block leaves the factory unless it meets Webber standards for surface finish. These standards are considerably higher than those set by the National Bureau of Standards.

For the finest surface finish as well as all other essential qualifications of the best gage blocks—buy Webber. Sets available promptly as follows:

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| Set No. 84A | \$350.00 |
| Set No. 84B | 235.00 |
| Set No. 43A | 185.00 |
| Set No. 43B | 150.00 |
| Set No. 38A (Thin Blocks) | 195.00 |
| Set No. 38B (Thin Blocks) | 155.00 |
| Set No. 14A (Angle Blocks) | 450.00 |

Webber
GAGE COMPANY

12899 TRISKETT ROAD • CLEVELAND 11, OHIO

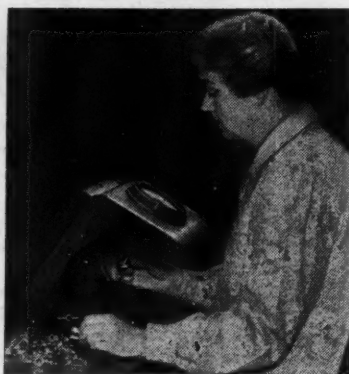


ram. A proportional pressure valve allows for the gradual application of pressing force in any degree from zero to full capacity.

A special platen extension is provided to facilitate loading and unloading the press.

Rieger Spindle Stop

Applicable to lathes having $\frac{3}{4}$ -inch spindle holes, notably Atlas, Clausing, Craftsman, Logan, 9-inch South Bend, and other lathes, the Rieger Spindle



Give your Inspectors, Toolmakers and Machinists better eyes for better work . . . with the

PORTABLE INSPECTO-GRAPH

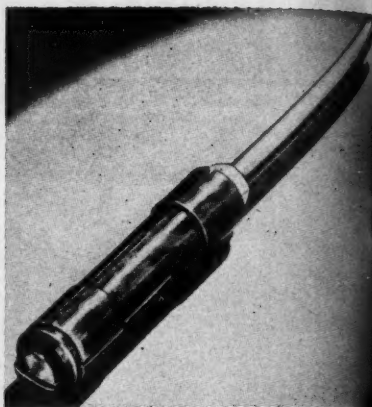
Can be used anywhere by merely plugging into nearest 110 volt A.C. outlet. Two fluorescent tubes concentrate shadowless, diffused light on object to be inspected. Large four-inch lens magnifies work without distortion. Saves workmen's eyes and quickly detects defective parts. **Price \$35.00**

Write for descriptive literature.

S. LOWE & SONS CO.

105 Sanford St.

Fairfield, Conn.



Rieger Spindle Stop

Stop illustrated herewith, product of the Rieger Mfg. Co., Dept. MMS-7, Miami, Ohio, features an expanding collet action. While the front end of the device is held in place with one screw driver, a turn on another at the rear end causes the stop to expand, thus tightening itself in the hole of the headstock spindle without scarring or burning the walls; it is claimed.

Designed for repeat operations on the lathe, the Rieger Spindle Stop can be utilized with or without a chuck. The stop is equipped with a $\frac{1}{8}$ x 4-inch extension for limiting hollow work and for protrusion into the chuck for stopping short pieces. The extension is so designed that it can be turned down to a smaller diameter if desired. Where solid pieces are to be positioned, the extension can be removed.

The body of the Rieger Spindle Stop is 3 inches long and is slightly under $\frac{1}{4}$ inch in diameter when contracted.



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VARIOUS WIDTHS
and GAUGES



BUTTS AND
CONTINUOUS LENGTHS

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S & S MACHINE WORKS

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GUARDS
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A Full Range SENSITIVE DRILL



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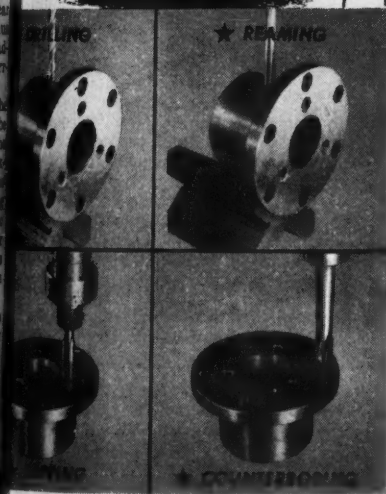
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UP THE SCHEDULE ☆ WIN THE WAR QUICKER

★ With speeds from 185 to 3450 R.P.M. available, quick set-ups can be made on multiple spindle machines for parts having a wide variety of operations. Power feed, back gear, built-in tapping and coolant furnish all the necessary attachments. Footburt Sensitive are rigidly built to drive cutting tools to their full capacity. Write for price and delivery information.

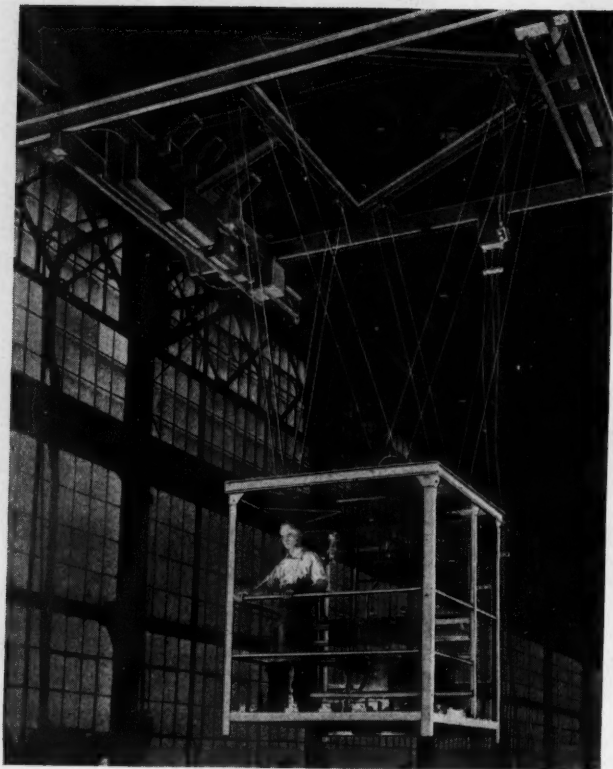
THE FOOTE-BURT COMPANY

CLEVELAND 8, OHIO

Detroit Office: General Motors Building

Sensitive
DRILLING MACHINES

FOOTBURT



Cleveland Tramrail Stabilized Platform

Cleveland Tramrail Stabilized Platform

The Cleveland Tramrail Division of The Cleveland Crane & Engineering Co., Wickliffe, Ohio, has developed a stabilized platform that can be raised or

lowered without swinging and can be traveled longitudinally or laterally to any point in an area covered by the crane on which it is operated. The platform is especially designed for use in the spray painting of large air cargo ships as well as in some of the assembly operations.

Besides the usual switch for preventing

the floor area of the platform is divided into two sections. Approximately one third at the rear is for drums of paint and other equipment carried. The large space in the front is for the painter's use. Three master drum controllers are mounted on the railing at the rear of the painter's area for operation of the hoist bridge and trolley. Speed of each may be varied with these controllers. Three sets of foot operated controllers are also provided on the

floor along the three outer sides of the painter's area. These controllers enable the painter to move the platform to any location desired and provide single slow-speed motions suitable for spray painting.

POWERFUL PRESSES THAT USE NO POWER



Famco Arbor Presses deliver 1,000 lbs. to 15 tons pressure, need no wires, motors, line shafts or power. Widely used with girl operators for assembly and dismantling jobs. All 32 stock sizes, bench and floor types, are easy to operate, take small space, ruggedly built yet readily portable.

FAMCO MACHINE CO., 1324 18th St., Racine, Wis.

famco ARBOR PRESSES
FOOT PRESSES
SQUARING SHEARS

Famco Squaring Shears will cut up to 18 gauge mild steel. Made in five sizes. Powerful, rugged, accurate, easy to operate.

Famco Foot Presses, bench and floor types, are ideal for speeding up numerous light forming and stamping jobs



Tramrail Sto
Platform

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CLECO PRODUCTION...



A Cleco riveter
working on the famous
Lockheed "Lightning"

Keeps Pace
with the
Aircraft Industry's Demands

THERE are dozens of models and sizes of Cleco aircraft riveters, many styles with handles made of steel or aluminum. These tools strike accurately controlled blows, causing the rivet metal to flow uniformly without structural deterioration. Their use insures tight rivets, and avoids damage to the metal being riveted. Write for Bulletin 85.

OTHER CLECO RIVETING EQUIPMENT

We also make an extensive line of squeeze riveters. Let us tell you about the new Type P "triple-safe" Cleco sheet holders. Our new RIV-N-JECTORS, for inserting rivets, save 90% of the rivets lost when handled by hand. Write for information.

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THE CLEVELAND PNEUMATIC TOOL CO.

3781 East 77th Street

Cleveland 5, Ohio

Branch Offices in All Principal Cities

POPULAR CLECO AIRCRAFT RIVETERS



Inserting Cleco Type "P" Sheet Holders

ing the platform from being hoisted beyond the upper limit, a slack cable release is provided to assure safety when lowering the platform. Through means of this feature, the platform is said to be stopped immediately when lowering if any part of it comes in contact with any object sufficiently to cause slackening in any of the hoisting ropes.

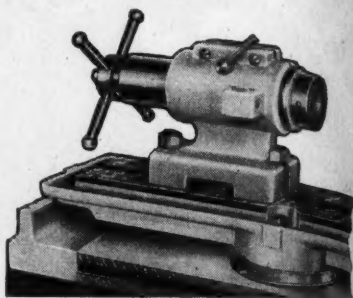
The unit illustrated is of all-welded steel construction. It is designed to carry a load of 5 tons and has a hoisting speed of 18 feet per minute. This type of stabilized platform is suitable for operation through a vertical plane up to 30 feet and may be furnished for operation at any hoisting speed from creeping to 50 feet per minute or more.

"Knock-Out" Model B647 Tap Grinding Fixture

Adaptable to any make of tool grinder, a tap grinding fixture designated as the "Knock-Out" Model B647 is now being produced by the K. O. Lee Co., Aberdeen, South Dakota. Sturdily and compactly built, the fixture utilizes collets to accommodate taps from No. 8 to and

including 2½ inches in diameter.

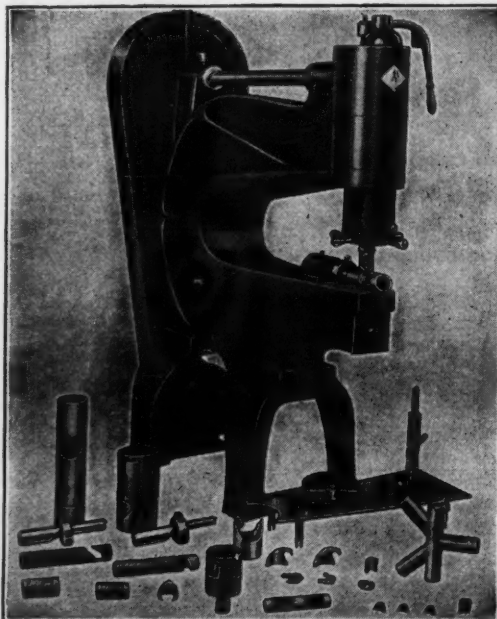
By means of the Model B647 fixture all grinding operations necessary on taps, including relief and flute as well



"Knock-Out" Model B647 Tap Grinding Fixture

as salvage grinding operations, can be performed with one setup. Two, three, four, five and six-flute taps can be ground either right or left.

Easily operated, the Knock-Out Model B647 Tap Grinding Fixture can be furnished with T-slot blocks to fit any make of tool grinder.



For **FAST** and **SAFE** cutting of sheet metal, duplicating parts, and to relieve other machine tools, investigate the

SAVAGE NIBBLING MACHINE

TUBE SLOTTING AND TUBE SHAPING
For cutting flat sheets by template or to a scribed line.

Cutting Capacities

Flat Sheets Mild Steel ¾"

Tough Alloys ⅝"

Tubing

Wall thickness to ⅜"

1" I.D. to 36" O.D.

The Fastest Method of Tube Slotting and Shaping by Guide Template.

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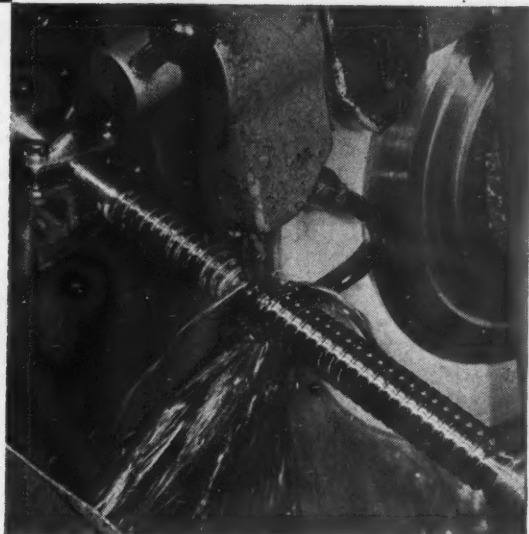
4"

Slotting
emplate.

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Machines

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*When a
Grinding Job
Is Critical---
Do it with
"Economy"*



27 MINUTES is the time required to grind these Nose Wheel Landing Gear Screws (Modified Acme Thread .135 deep) at the Bell Aircraft Corporation, Niagara Frontier Division, Buffalo, N. Y. Formerly, burning, poor finish and inability to meet production schedules were common complaints of the operators. Switching to Economy Grinding Oil No. 1584 brought immediate improvement in finish and increased production—a saving in time and money.

Economy Grinding Oil No. 1584 follows closely the engaging point of wheel grain and work surfaces. Net result—finished surface of extreme accuracy of dimension and contour, notably free from heat checks and surface distortion.

If you have a particularly difficult grinding, cutting, drawing or lubricating job, put it up to us. Yours for the asking—new book—"Grinding Oils and Lubricants" 1944-F-16. Write for it on your company letterhead.

ANY
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Machines

THE WHITE & BAGLEY COMPANY

WORCESTER, MASS., Chicago, Detroit, Minneapolis

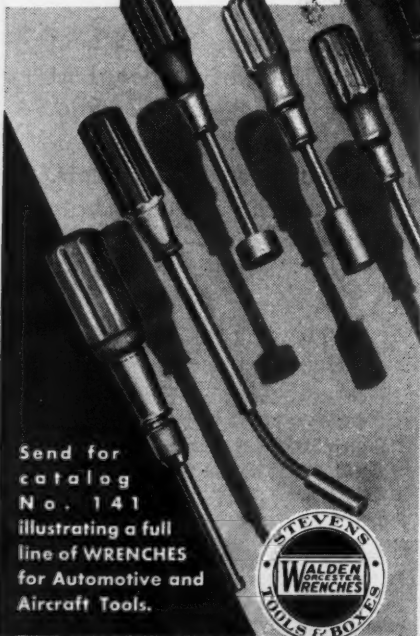


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FASTER and BETTER . . .

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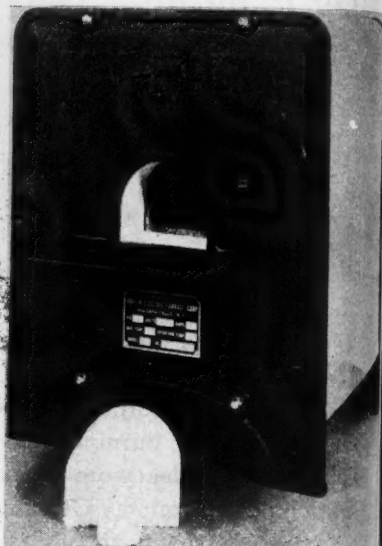
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Harper Electric Laboratory Furnace

A high temperature electric laboratory furnace with maximum temperature of 2750 deg. F. and operating temperature of 2500 deg. F. has been announced by the Harper Electric Furnace Corporation, Niagara Falls, N. Y.

The furnace is designed for industrial and school laboratory uses where materials are to be heated in an oxidizing



Harper Electric Laboratory Furnace

ing atmosphere at temperatures above those attainable with metallic elements. The unit is said to have many applications where special conditions are involved, such as rapid heating, or heating in special atmosphere not injurious to silicon carbide.

The Harper Electric Laboratory Furnace is equipped with a silicon carbide muffle and is heated with Globar non-metallic heating elements located above and below the muffle to assure uniform distribution of heat. Either a plug type or a counterbalanced door is available. The furnace is made in various sizes with chamber dimensions of 2½ inches high x 3½ inches wide x 5 inches deep and 5½ inches high x 6 inches wide x 18 inches deep. The unit is available for bench or floor mounting.

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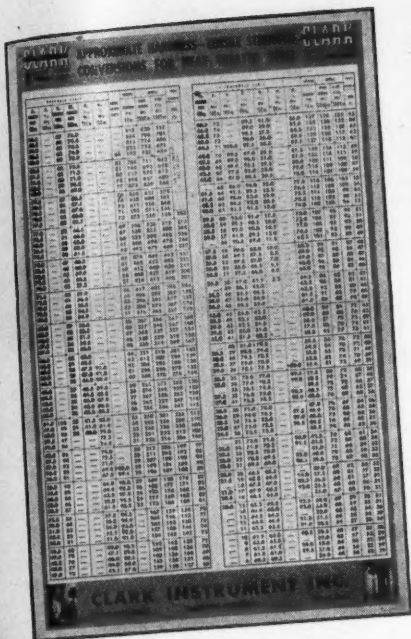
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If you are a production executive whose responsibility includes the hardness testing of metals, you will certainly want one of these new charts for your office, shop, or laboratory. Handsome in appearance, printed in three colors, with the very minimum of advertising, it will prove its value every hour of every day. Type is large, easily read at a distance of several feet, yet the chart itself is only 24" wide and 32" high—about the size of a calendar.

Although a chart like this is relatively expensive to produce, and the quantity is rigidly limited, a copy is yours—free for the asking—if you request it on your letterhead. Write Dept. MM, CLARK INSTRUMENT INC., 10200 Ford Road, Dearborn, Michigan.



DoAll Optical Flats and Monolight

Unusual wearability and low coefficient of expansion are principal features of the DoAll Optical Flats now being manufactured by Continental Machines, Inc., 1306 Washington Ave., So., Minneapolis 4, Minn. Made from fused Brazilian quartz which is said to have a hardness of seven on the Moh scale, the flats are claimed to remain flat even after considerable handling, thus allowing for the quick and accurate inspection of master flats, flat surfaces of gages, machine parts, anvils of mi-



DoAll Optical Flats and Monolight

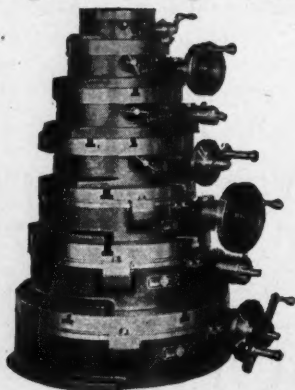


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chrometers and comparators, and steel bars.

The DoAll Optical Flats are supplied in diameters of 2, 3, 4, 5, 6, and 10 inches, each size flat being packaged in a convenient hardwood case. They are available with the following grades of accuracy: one millionth accuracy for laboratory gage block and instrument inspection, and two millionths accuracy for checking instruments and fine tools.

A monochromatic light available from Continental Machines, Inc., to provide light waves for the DoAll Optical Flats for use in making fine measurements features large capacity and compact design. The DoAll Monolight, as it is known, provides helium light rays of high intensity, thus affording maximum illumination for distinguishing the light wave unit known as the "fringe" or interference band. The rays from the light, when observed through DoAll Optical Flats, produce interference bands of 11.6 micro-inches. These interference bands are used to measure flatness.

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Ideal for
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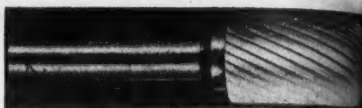
North Bros. Mfg. Co., Phila. 33, U. S. A.
Established 1880

height and parallelism. With the combination of optical flat and Monolight, variations in the size and flatness of parts can be accurately read within millionths of an inch, it is claimed.

Designed for operation on 110 volts, 60 cycle, single phase current, the DoAll Monolight includes a removable projection head which can be tilted 90 deg. up and 21 deg. down and can be rotated 360 deg. In addition, the head can be adjusted so that lamp is a distance of $8\frac{1}{4}$ to 12 inches from table. Net weight of Monolight, 12 pounds.

Carbide Specialties Hard Chrome Plated Rotary File and Burr

A combination rotary file and burr which is hard chrome plated to provide for increased life has been placed on the market by Carbide Specialties, 1114-18 Southfield Rd., Lincoln Park 25, Mich. The cutter, which is specially heat treated and surface finished before plating, is offered in a complete range of standard sizes and shapes and, when necessary, can be manufactured to specifications to meet special requirements.



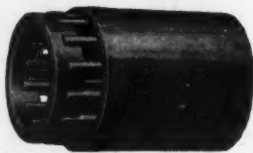
Carbide Specialties Hard Chrome Plated Rotary File and Burr

The company also offers a service whereby worn high speed steel rotary files can be reconditioned and placed to provide additional tool life.

Matthews "Airgrip" Marking Unit

A machine for marking delicate and precision parts, designated as the Matthews "Airgrip" Marking Unit, has been developed by Jas. H. Matthews & Co., 3944 Forbes St., Pittsburgh, Pa. Marking of metal, glass, fiber or plastic parts having ground or mirror surfaces that cannot be marred or distorted is said to be accomplished by means of a short blast of fine grit material against rubber or celluloid stencil masks upon which the parts to be marked are placed. The desired mark

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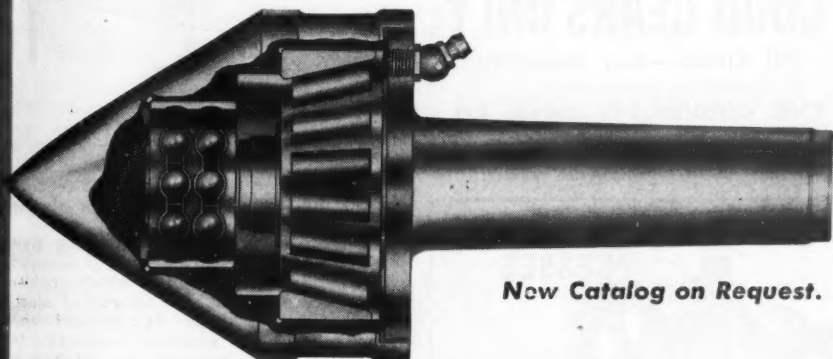
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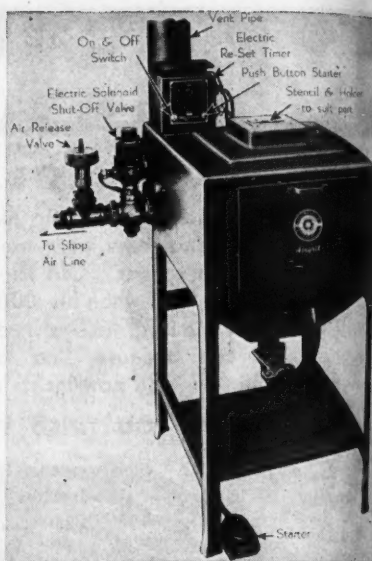
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ing, whether it be letters, numbers, symbols or designs is cut into the stencil and the resulting mark is said to be a light, clear-cut impression, obtained without liquid to cause rust and without burrs. Suitable fixtures are designed to hold parts so that they can be quickly handled by the operator; marking speed of the machine depends only on dexterity of operator.

The unit is operated by air pressure similar to sandblast equipment. It is said to operate most successfully on a volume of air at low pressure, five to



Matthew "Airgrit" Marking Unit

eight pounds at the nozzle, and require approximately 30 cubic feet of air per minute while in operation.

The Matthews Airgrit Marking Unit is equipped with an electric solenoid valve and a timing unit, which enables the operator to fix the length of blast so that parts may be marked uniformly and with greatest legibility. In operation, the part to be marked is placed over the stencil mask. The timing device may be set at from $\frac{1}{4}$ second to 14 seconds. Most parts are marked with a two-second blast. If the blast is timed at two seconds, the pointer on the timing device is set

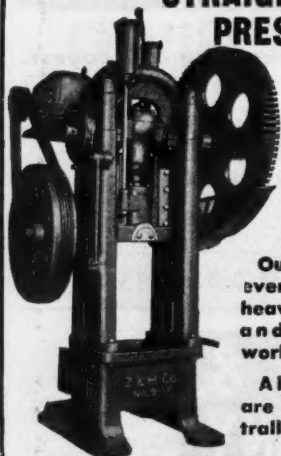
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DAYTON 2, OHIO

APEX

Socket Wrenches

September, 1944

MODERN MACHINE SHOP 269

the figure 2. The unit is started by pressing foot switch. The blast is turned on immediately and remains for two seconds and then shuts off automatically. Some parts may require a three or four-second blast, while others may take but $1\frac{1}{2}$ seconds or less. The length of blast may be determined by experimenting with a few pieces in order to arrive at the correct time for the best possible impression.

When the plant air line is used, a reducing valve and gage should be installed between the line and the unit, so that the required five to eight pounds of air pressure is available at the nozzle. This valve and gage is not furnished with the unit. An air filter or oil separator should be connected between the reducing valve and the unit. This filter will absorb the moisture that may be present in the line, due to condensation, thus keeping the air clean and dry. No 180 grit is recommended for best impressions and 25 pounds is included with each unit.

"Airgrit" stencil masks, into which the desired marking is cut, are furnished in other celluloid, patented rubber, or rubber-covered brass. The maximum area of the mark produced

with a $\frac{5}{8}$ -inch I. D. nozzle unit is 1 inch square. Alterations can be made to increase this area if necessary. In order to guard against bleeding of the abrasives which might escape under pressure, a vent pipe of at least 6 feet in length should be installed in the unit.

The Matthews Airgrit Marking Unit is 30 inches high, covers a floor space of 16 x 19 inches, and has a shipping weight of 100 pounds.

Miskella Infra-Tray-Veyor

Marketed by Infra-Red Engineers Designers, 1633 E. 40th St., Cleveland, Ohio, the Miskella Infra-Tray-Veyor shown herewith is designed for use in drying, preheating, baking processing and heat treating parts and materials. The unit is standardly wired for operation on 230 volts but can be arranged for use on 115 volts when specified.

The Miskella Infra-Tray-Veyor is equipped with eight sealed-in-reflector type, 250-watt Mazda lamps, each of which is said to have a life of 5,000 hours. Heat units have 11 x 22-inch faces. Widest opening between heat



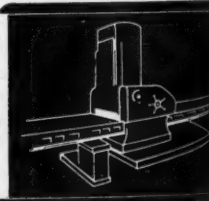
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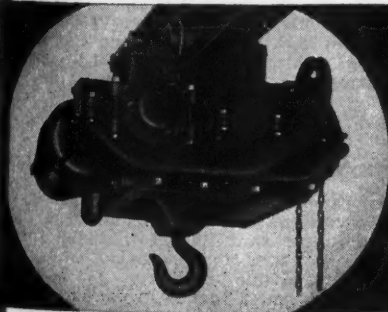
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**for MOUNTING
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or used as
ANGLE PLATE**

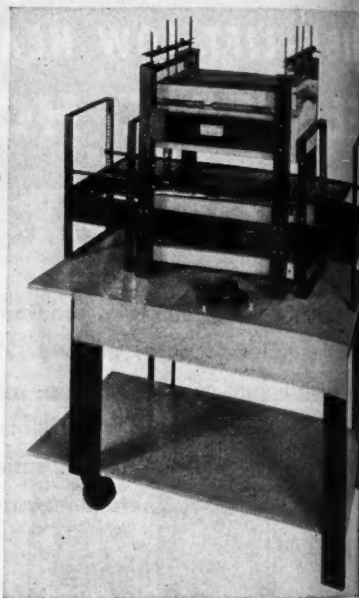
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units is 10 inches. The design of
Tray-Veyor also includes four expand-
metal trays, each 11 x 11 inches in size.

Extra equipment available for the
Miskella Infra-Tray-Veyor includes
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lamps up or down to provide any re-
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Miskella Infra-Tray-Veyor

Tray-Veyor, with or without Powerstat,
is 70 to 300 deg. F. A calibrated dial
with indicator needle is used to estab-
lish specific heat settings.

The Miskella Infra-Tray-Veyor is
15 inches high x 15 inches wide x 48 inches
long. Shipping weight is 90 lb. (30 lb.
extra with temperature control).

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Brand Tool & Supply Co., 500
Washington Blvd., Los Angeles 15, Cal.
announces that its International Inside
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for measuring holes from 1 1/4 to 6 inches
from 1 1/2 to 12 inches in diameter. The

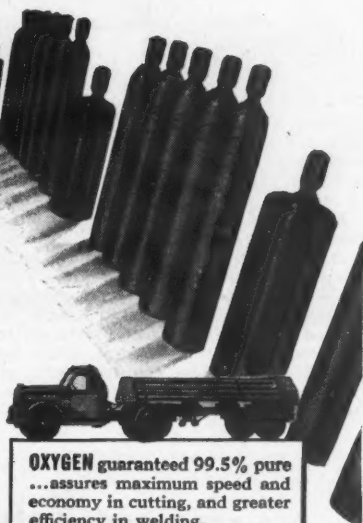
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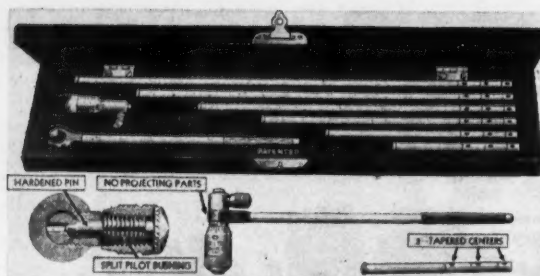
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International Inside Micrometer
micrometer head together with its hardened and adjustable measuring rods is supplied packed in bakelite case instead of wooden case as heretofore.

In addition, the measuring rods have been streamlined by making the contact point of each smaller, thus enabling user to more easily obtain "feel" of hole to be measured. The large spring type screw in the micrometer head is designed to provide even tension on measuring rods at all times and may be adjusted to suit the requirements of the user. The markings on the micrometer head are deep etched for easy reading.

Model 1100 Hydra-Vise

A vise of rugged, streamlined design which is said to be ideal for installation on castor type benches or stands, to be known as Model 1100 Hydra-Vise, now being manufactured by Air-Hydraulics, Division Beyer Machine Co., Jackson, Michigan.

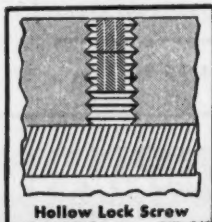
The movable jaw of the vise is mounted on V-way and is provided with a simple adjustable gib to compensate for wear. Jaw plates can be easily removed for attaching special plates for bending, swedging, punching, stamping, and riveting. Machine bosses are provided for quick attachment of jaws for any internal holding or pulling operation.

Designed for effortless operation, the Model 1100 Hydra-Vise may be set to provide any stroke within its capacity and is controlled by a foot-operated unit thus allowing operator free use of both hands for balancing work. The vise is supplied completely assembled, ready for bolting to bench.

DESIGNED FOR Safety . . . BUILT FOR Strength



The natural advantages of hollow set screws include safety on revolving or moving parts, ease of assembly in confined places, and more compact construction.



The tremendous holding power of Mac-it Hollow Set Screws makes locking devices unnecessary in all but a few applications. In these cases, Mac-it Hollow Lock Screws are used like jam nuts to prevent any possibility of loosening.



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Other Mac-It Products Include:
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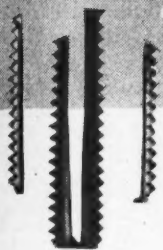
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September, 1944



By the **ELOX** METHOD

The Elox method of removing a broken tool from a part being machined might very aptly be called "Disintegrator Drilling". It makes no difference how hard the broken tool may be. A core is drilled down through it by the Elox electrical disintegrator and the core removed. Then the remaining strips of thread of a tap or the cutting flutes of a drill or reamer are easily collapsed and picked out of the hole.

This method does not in any way damage the metal of the work part or the work already done on it. The temperature of the metal of the work part is not raised sufficiently to cause any metallurgical change.

The Elox method is also used to "drill" holes of various shapes in hardened dies and machine elements without annealing.

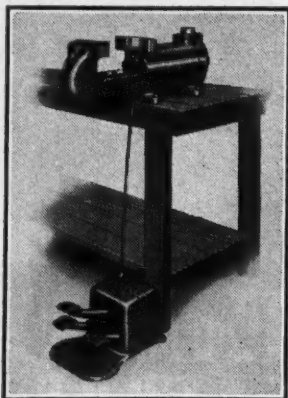


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ELOX CORPORATION

3-252 GENERAL MOTORS BLDG.
DETROIT 2, MICHIGAN
Plant—18273 LIVERNOIS AVENUE
DETROIT 21, MICHIGAN

Specifications of the Model 1100 Hydra-Vise are as follows: width at lugs, 6 $\frac{1}{4}$ inches; length overall, 26 inches; height



Model 1100 Hydra-Vise with Hydra-Operator Unit

overall, 8 inches; width of jaw, 6 inches; depth of throat, 4 inches; width of opening (maximum), 8 inches; jaw plate

holes in jaws, $\frac{1}{2}$ inch diameter, 3 $\frac{1}{2}$ inch centers; jaw plates, $\frac{3}{4}$ x $1\frac{1}{4}$ x 10 inches long; weight, 75 pounds.

Specifications of the Hydra-operator unit are as follows: length 14 $\frac{1}{2}$ inches; width, 10 $\frac{1}{4}$ inches; height, 8 inches; fluid capacity, 8 cubic inches; jaw pressure capacity (maximum), 10,000 lb.; weight, 65 pounds.

Hammond Model V-10 Abrasive Belt Grinder

Operations such as deburring, dressing, chamfering, beveling, and the finishing of pads, bosses, and thin sections of castings, forgings, stampings, and so on, can be readily performed on the Model V-10 "wet-n-dri" abrasive belt grinder announced by Hammond Machinery Builders, Inc., 1615 Douglas Ave., Kalamazoo 54, Mich. The machine is designed for use with abrasive belts up to 10 inches and weighs over a ton.

Construction of the Model V-10 is such that abrasive belt can be operated to the edge of the belt backing plate where clearance is provided for getting into corners. The machine is arranged

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The tough, resilient, coiled rawhide faces of C/R Hammers and Mallets strike effective blows without battering or marring... protects finished surfaces, machines delicate insulation and parts. Speed die-setting, assembly, no fatiguing re-coil. Reduce breakage and spoilage. Sizes and weights for every need.



C/R Hammers have permanent malleable iron heads which take replaceable insert faces of coiled mechanical rawhide.

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September, 1944

FOR *Quicker* SHAPING, GRINDING, POLISHING USE **SKILSAW** PORTABLE GRINDERS!

● SKILSAW PORTABLE GRINDERS deliver *top load speed*, even when the going is toughest. That's why they grind down beads, studs and fins faster . . . speed up shaping, buffing and polishing. They're quality-built throughout, with many superior features such as special ball-bearing inserts to absorb vibration and spindle thrust. That's why SKILSAW PORTABLE GRINDERS run smoother, cooler, and last longer.

You'll save time, money and manpower with SKILSAW PORTABLE GRINDERS on every finishing job. Ask your distributor to show you on your own work.



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PORTABLE ELECTRIC

MAKE AMERICA'S HANDS MORE PRODUCTIVE 



INCREASE YOUR METAL CUTTING PRODUCTION

In selecting hack saws that are needed today on production lines, you will always get results with GRIFFIN. The line is complete . . . a blade for every cutting job . . . the quality proven by 63 years of experience.

Distributors have them.

JOHN H. GRAHAM & CO., INC.

General Sales Agent

105 DUANE ST.

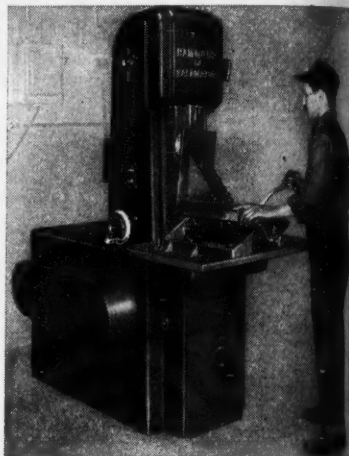
NEW YORK CITY

Made by G. W. GRIFFIN CO., Franklin, N. H.



to accommodate various types of table and special work-holding fixtures for machining different shapes and sizes of parts. It is standardly equipped with either oscillating or plain table, depending upon the class of work being handled.

The oscillating table has a micrometer stop which is graduated in 0.001 inch for accurately controlling depth of grind, and is machined with three slots for attaching fixtures. A single handle for both feeding and oscillating the work is included. Oscillation is



Hammond Model V-10 Abrasive Belt Grinder

to permit faster cutting and provide uniform wear on belt and belt backing plate.

The idler pulley of the Model V-10 is mounted on a heavy column which incorporates a built-in automatic belt tensioning device. A large capacity coolant tank unit is located in the base of the machine, and adequate controls are located outside the machine within easy reach of the operator. For dry operation, the coolant unit is omitted and connection for exhaust provided.

Farnham High Speed Carriage Drill

Paragon Research, Inc., 2061 S. Park Ave., Buffalo 20, N. Y., announces a high speed carriage drill for production drilling of aluminum alloy spars, wing panels, and other long assemblies. Many

Build Your Present and POST WAR TOOLING Around **MEAD** PNEUMATIC EQUIPMENT



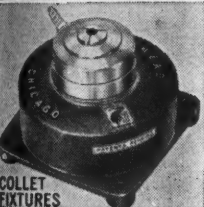
AIR PRESSES



AIR CLAMPS



PNEUMATIC WORK FEEDERS

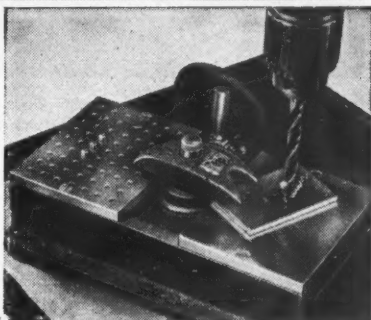


COLLET FIXTURES



MIDGET AIR CLAMPS

FLAT TOP WORK HOLDER



Because . . .

1. It will save more than its cost in mechanical movements.
2. It will save more than its cost in increased production.
3. It will save more than its cost in the construction of jigs and fixtures.
4. It will improve morale by reducing muscular fatigue.
5. It will increase your plant capacity without additional floor space.

To speed war work—to get a running start into faster, more economical post-war production—investigate Mead Pneumatic Equipment now!



MEAD SPECIALTIES COMPANY

15 SO. MARKET STREET
DEPT. 94-AA • CHICAGO, U. S. A.



NEW CATALOG READY

Send for copy of our new Air Power Catalog illustrating, describing many new man-and-money-saving devices.



Farnham High Speed Carriage Drill in Use

factured by the Farnham Mfg. Co., Buffalo, N. Y., the unit is furnished complete, ready for installation on rails fastened to an assembly fixture.

The Farnham High Speed Carriage Drill can be obtained with a variety of carriage mountings—both horizontal and vertical. For curved surfaces, such as wing panels, a carriage unit is avail-

cally slows down for the drilling return to starting position.

The spindle of the Farnham Carriage Drill is belt driven by a standard cycle $\frac{1}{2}$ h. p. motor at speeds up to 10,000 r. p. m. Holes up to $\frac{3}{8}$ inch in diameter can be drilled with the unit, which is belt bearing mounted for easy operation by women workers.

To Speed Victory! WE ARE READY TO SERVE YOU!

"**American**"

Cold Pipe, Conduit and Tube Bending Machines

Twelve types to select from. Hand operated capacities $\frac{1}{4}$ to 6" inclusive. Motor operated $\frac{1}{2}$ to 8" inclusive.

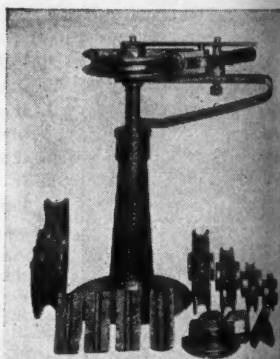
A few of our More Than 12,000 Customers:

Bureau of Ships, Wash., D. C.; Henry J. Kaiser Co., Calif.; Pacific Bridge Co.; Bethlehem-Hingham Shipyards; Hercules Powder Co.; Stone & Webster Engineering Corp.; E. I. Du Pont de Nemours & Co.; Louisiana Shipyards; Westinghouse Elec. & Mfg. Co.; General Motors Corp.; Carnegie-Illinois Steel Corp.; Henry Ford Company.

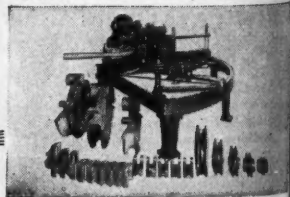
Quick Deliveries

"**American**"
PIPE BENDING MACHINE
Company INC.

25 PEARL ST. BOSTON, MASS.



Write Air Mail for printed matter



Carriage

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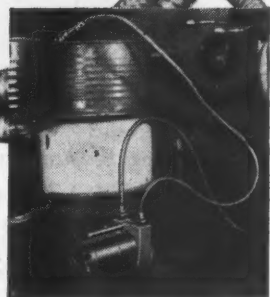
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CARRY THE PINCH-HITTER TO YOUR TROUBLE SPOT!

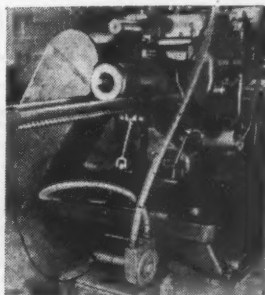
**A PORTABLE
SELF-PRIMING
CENTRIFUGAL PUMP**

Made
under Patent
No. 2,164,869
and other patents
pending.

\$89⁵⁰
COMPLETE



**Cleans Sump and Puts In
Fresh Coolant**



Serves in Trouble Spot

Idle men and machines cut production. **RESUME OPERATION IN 3 MINUTES** with our new **PINCH-HITTER** portable pump. *Save hours* with this all-purpose, utility pump—self-priming, with 110-volt motor, cord and plug, suction and discharge hose and nozzle. Simply set on floor, box or machine; throw suction hose in sump; tie discharge hose to machine and plug in electrical outlet. **PINCH-HITTER** can also be used for cleaning sump and liquid transfer. Sturdy construction provides for handling abrasives or steel chips and for *continuous service*. Easy to carry in one hand. Adaptable to all types of machine tools.

SPECIFICATIONS

MODEL: SP 4400-20-1/4.

CAPACITY: Water soluble. 1200 G.P.H.
Light oil. 1000 G.P.H.
Heavy oil. 600 G.P.H.
(46 SAE Max.)

SUCTION: 3/4" oil resisting steel
braided 6 ft. long hose.

DISCHARGE: 3/4" oil resisting steel
braided 6 ft. long hose. One valve and

nozzle assembly. (Pump will handle
four nozzles. Price \$3.25 each nozzle.)

MOTOR: 1/4 H.P. NEMA, 110 v. A.C.
50/60 cycle. Capacitor type, with cord,
switch and plug.

Pump will deliver from a drop per
minute to full capacity by regulating
discharge nozzles. Not recommended
for permanent service on grinders or
honors.

BRADY PUMP CO., INC.
MUNCIE, INDIANA, U.S.A.

September, 1944

Precision External Indicating Gages for Use with "Metricator"

Development of precision external indicating gages using a flow of air as the measuring medium and designed for operation in conjunction with the "Metricator" instrument is announced by Metrical Laboratories, Inc., 417 Detroit St., Ann Arbor, Mich. The gages can be obtained in either the indicating ring or indicating snap gage type, depending on the size of the external diameter to be measured.



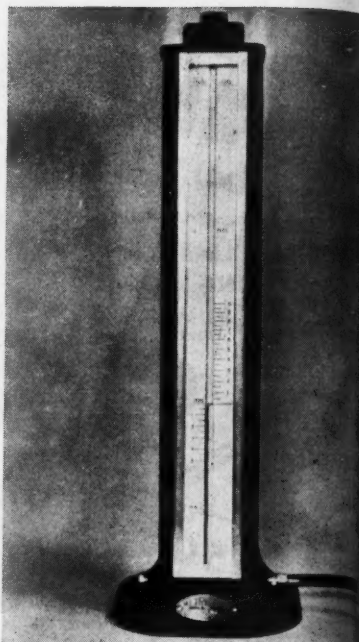
Now... A Heavy-duty Bench-type Engraving & Marking Machine The PANTO Model UE-3

- HEAVIER CUTTING SPINDLE
- FOUR SPINDLE SPEEDS
- MORE PANTOGRAPH REDUCTIONS
- FORMING GUIDE ATTACHMENT

Plus the exclusive Panto feature... Interchangeable heads for engraving, electrical marking, and acid etching.

➤ Write for new Catalog

H. P. PREIS ENGRAVING MACHINE CO.
149A Summit St., Newark 4, New Jersey

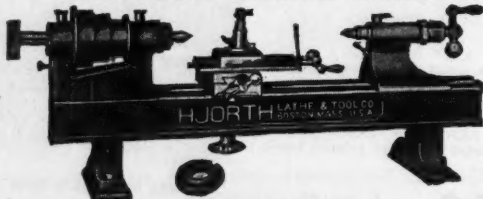


"Metricator"

According to the manufacturer, variations as small as 0.000025 inch can be readily detected with the gages, and for parts requiring an extreme degree of accuracy, the amplification can be sufficiently increased so that parts can be sorted into groups of 0.000010-inch size difference without any effort on part of the operator.

The indicating ring type gages are especially designed for the gaging various external diameters and are

... for more than 1001 odd jobs



HJORTH LATHE & TOOL CO.

12 BEACON ST., WOBURN, MASS.

The Hjorth Bench Lathe has the speed, accuracy, handling ease, and dependability that appeal to every operator. That's why you'll find the better shops equipping with the Hjorth Lathe.

**WRITE TODAY FOR DATA
AND PRICES.**

Grobet
THE COMPLETE LINE

Hand Cut and Ground Cut ROTARY FILES

High speed Steel Rotary Files, in shape, size and coarseness of cut for every industrial purpose . . . for work on steel, aluminum, magnesium, wood, rubber, plastics, etc.

**Diesinker's Burs,
Tube Burring Cutters
Chatterless Counter-
sinks, Etc.**

*Write for illustrated catalog R
the most complete of its kind.*

GROBET FILE CO. of AMERICA

21 Canal Street



New York, 13 N. Y.

IMPORTERS OF GROBET SWISS FILES

MFRS. OF GROBET ROTARY FILES

MODERN MACHINE SHOP 285

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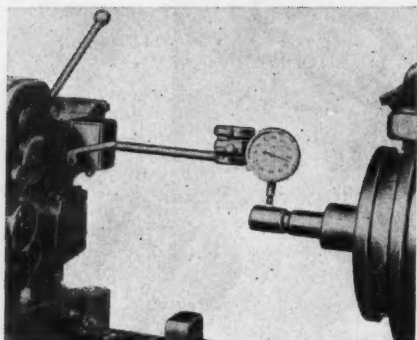
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September, 1944



Main Super Power Magnetic Indicator Base in Use

of two powerful "Alnico" magnets, strength of which is claimed to be ample for supporting indicator at the extreme end of the rod in any position.

According to the manufacturer, the Main Super Power Magnetic Indicator Base can be adapted to any type or make of indicator and is guaranteed to retain its full magnetic charge for a period of five years.

Baker Model 60-HO Extra Heavy Duty Vertical Hydraulic Feed Machine with Auxiliary Horizontal Hydraulic Feed Unit

The illustration herewith shows an extra heavy duty vertical hydraulic feed machine with auxiliary horizontal hydraulic feed unit for core drilling, boring, and counterboring track links used in the manufacture of heavy duty Army tractors. The machine, which is designated as the Model 60-HO, is a development of Baker Brothers, Inc., Toledo 10, Ohio.

At each cycle of the machine, two track links are produced—one right-hand and one left-hand. The machine is arranged with a four-station power index table which allows for loading and unloading of two parts at each indexing position while machine is cutting. The vertical hydraulic feed unit performs the various operations in the large bores in the links. The horizontal unit with multiple head drills the two bolt holes in the sides of links. The design of the machine is such that operator has only to load and unload



Save Set-up Time IN TAPPING AND REAMING!

Why waste valuable time making a tapping or reaming set-up that is accurate to a thousandth of an inch when you can correct inaccuracies up to 1/32" by simply using the right type of tool holder?

The Ziegler Floating Holder, because of its floating action, automatically compensates for spindle misalignment of as much as 1/32" off center or 1/16" on the diameter, thus making it possible to entrust set-up work to comparatively inexperienced help without danger of parts spoilage.

Get a Ziegler Holder and see for yourself in how much less time it will enable you to complete a set-up. Then you'll realize why it will pay you to have Ziegler Holders on all your machines.



FLOATING HOLDER
for Taps and Reamers...

W. M. Ziegler Tool Co.

1924 TWELFTH ST.
DETROIT 16, MICH.

WRITE FOR
CATALOG

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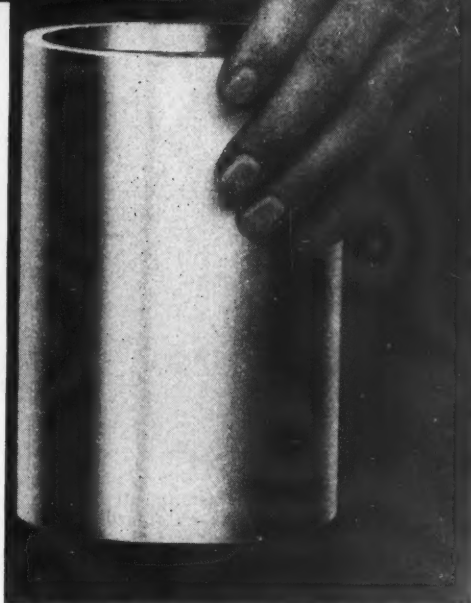
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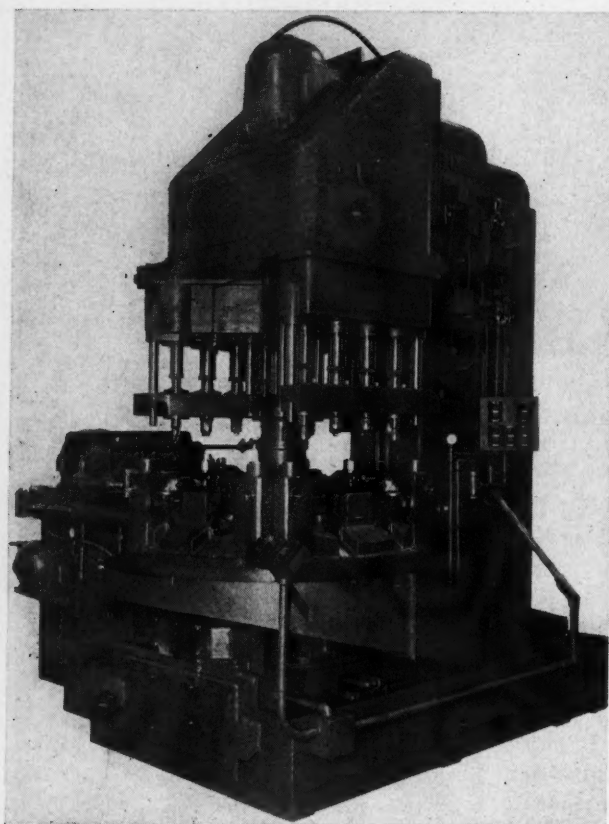
● Regardless of size or design required Bunting Cast Bronze Bearings more than ever before are meeting the needs of mechanical industry. Bunting Bearings are available, standard or special, to either commercial or precision tolerances. Many stock sizes, ready to install in practically every type of machine, and Bunting Factory Finished Tubular and Solid Bronze Bars are available from leading wholesalers everywhere. Write for catalog... The Bunting Brass & Bronze Company, Toledo 9, Ohio. Warehouses in Principal Cities.



● The more modern the machine the more Cast Bronze Bearings are used.

Bunting

BRONZE BUSHINGS ★ BEARINGS ★ PRECISION BRONZE BARS



Baker Model 60-HO Extra Heavy Duty Vertical Hydraulic Feed Machine with Auxiliary Horizontal Hydraulic Feed Unit

equipped with a heavy duty 12-spindle head which is mounted on an ample size saddle. This head is of large size, and, in view of the resultant overhang, the machine is provided with a centrally mounted cylinder which applies feeding power to head at point equidistant from all spindles. The large size feeding cylinder with ample feed pressure for the operations to be performed is stationarily mounted on the center of the index table, the index table being equipped with work-holding fixtures which are rotated around the cylinder.

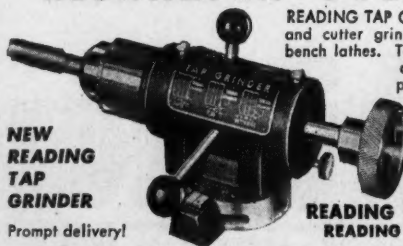
All major units of the Model 60-HO, such as the feeding cylinders on both the vertical and horizontal units, as well as drive motors, are readily

parts, the machine performing all required operations on parts automatically.

The vertical hydraulic feed unit is

accessible, thus reducing down time due to maintenance. Fully tooled with special work-holding fixtures, cutter bar holders and cutters, and bush plates,

RESHARPEN DULL TAPS!



**NEW
READING
TAP
GRINDER**

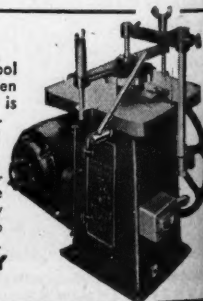
Prompt delivery!

READING TAP GRINDER can be used on tool and cutter grinders—surface grinders—even bench lathes. Taps sharpened after center is destroyed. **No collets.** Complete. No extras. Write!

Broach Keyseater

The Reading Bench Machine does not require bushings or guides. Very fast capacity from $\frac{1}{8}$ to $\frac{3}{4}$ machine. Low first cost.

**READING MACHINE COMPANY
READING (CINCINNATI), OHIO**

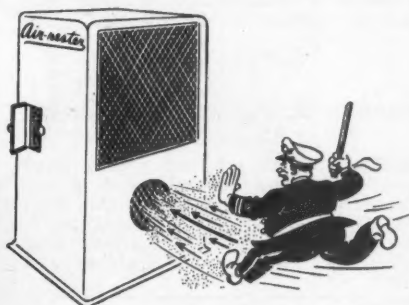


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For Safety's Sake

ARREST THAT DUST!

Yes, you, too, can now efficiently "Air-rest" the dust, grit, etc., from all types of grinders, buffing and polishing machines with a STANDARD "AIR-RESTER." Look to STANDARD for assistance, and you look to the pioneer of today's dust removal—collecting equipment.

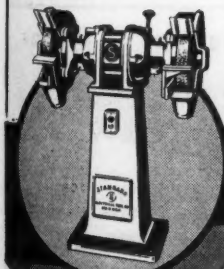
A STANDARD "AIR-RESTER" with its material handling fan costs no more than you pay for dust collectors with air handling fans!

The above photograph shows a 12" grinder with the AR-14 "Air-restor." 4 sizes: 300, 450, 1000 and 1200 C.F.M. The "Air-restor" can be shipped on MRO Rating.

Be on the safe side with an "AIR-RESTER." Write today for complete information.

Manufacturers of STANDARD:

Grinders, Tool Post, Internal, Disc, Carbide, Vertical Spindle, Snagging, etc. $\frac{1}{4}$ H.P. to 50 H.P. Buffing and Polishing Machines up to 25 H.P. SPEED LATHES.



The STANDARD ELECTRICAL TOOL Co.

CINCINNATI · 4 · OHIO

2487 RIVER ROAD

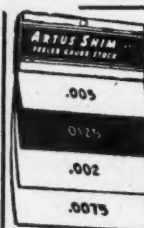
September, 1944

MODERN MACHINE SHOP 289

the machine is started through its cycle by means of push-button stations conveniently located to the operator.

Atlantic Emergency Plug Gage Blank Set

Addition of an emergency plug gage blank set to its Atlantic line is announced by the George Scherr Co., Inc., 198-A Lafayette St., New York 12, N. Y. The set includes 35 cylindrical plug gage blanks in steps of $\frac{1}{16}$ inch, as well



ARTUS PLASTIC SHIM & FEELER GAUGE STOCK The COLOR tells the THICKNESS

Long lasting plastic, replaces scarce metal. Each thickness a distinctive, easy to identify color. Impervious to oil. 5"x20" sheets. Special sizes to order. Handy assortment, shim stock, 12 colors—12 thicknesses (.001-.030). Bound together. \$3.75.

Order today. Immediate delivery.

INDUSTRIAL PRODUCTS SUPPLIERS
6 Broadway New York 4, N. Y.

U. S. HEADS

STANDARD SINCE 1915

FIVE
TYPES

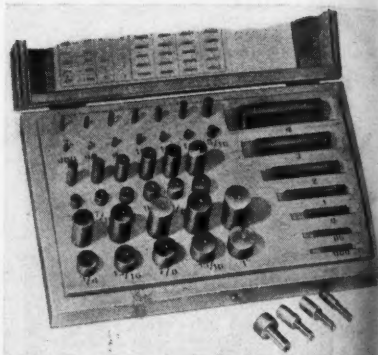
FIFTY-SIX
SIZES



Two Spindle Head
Both Spindles
Adjustable

The United States Drill Head Co.

1954 Riverside Drive
CINCINNATI, OHIO



Atlantic Emergency Plug Gage Blank Set

as a complete range of gage handles.

By means of the Atlantic Emergency Plug Gage Blank Set, any size plug gage from 0.029 to 1.000 inch can be produced with a minimum of work on a cylindrical grinding machine. The blanks are oil hardened throughout. The shanks are finish ground and the centers on both ends are lapped. Thus, only the outside diameters of the blanks must be finished by grinding when gages of commercial finish are required and by lapping for gages of higher standards.

G-B-M 4 1/2-Inch Collet Step Chuck

Designed to provide chucking facility on lathes, mills or grinding machines utilizing draw-in collets, a 4 1/2-inch size chuck has been added to the line of collet step chucks marketed by The Gilbert-Baker-Midlam Co., 38 N. Jefferson St., Dayton 2, Ohio.

New Nesting Type Tote Pans

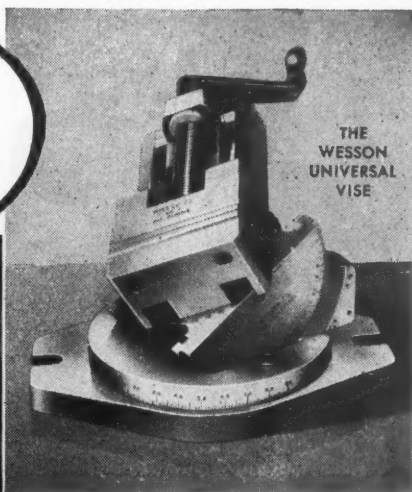
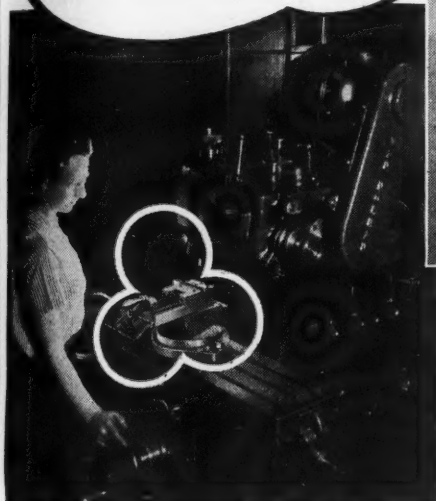


20" long x 12" wide x 6 1/2" deep.
16 ga., drag holes and handles both ends.

J. L. LUCAS & SON, INC.
Bridgeport, Conn.

WESSON VISE

makes **ANY** operator
an **EXPERT**



THE
WESSON
UNIVERSAL
VISE

Don't let those "manpower blues" get you down when you have precision angle milling to do! Remember . . . WESSON Vises are immediately available. You can get them on the job, fast! And any operator can do expert precision angle milling, drilling, grinding, reaming, slotting, or what have you . . . with WESSON Universal Vises. Rugged and rigid, free from "chatter," these vises permit high speed precision-production or tool room service, and save time and money.

Difficult angle set-ups can be made quickly . . . in a fraction of the time ordinarily required. Compact size, lowest overall height, ability to work in close quarters, and wide range of capacity permit many adaptations to standard machines . . . you multiply the uses of machine tools with WESSON Vises. Two sizes. See nearest distributor, or write for bulletin. WESSON PRODUCTS CO., 710 Fisher Bldg., Detroit 2, Mich.



WESSON PRODUCTS CO., Dept. MM-9,
710 Fisher Bldg., Detroit 2, Michigan

Please send me illustrated bulletin of WESSON Universal VISES and ANGLE PLATES.

Name and Title.....

Firm Name.....

Address..... City & State.....



For those Pain-in-the-neck Jobs

Post-war production will have as many, if not more, of those tooling jobs that seemingly "can't be done." The kind that give you a pain in the neck just to think about.

The business of Invincible Tool Co. is designing special tools to do those jobs that "can't be done." Send us your blueprints, sketches or samples—let us cure that production or mechanical pain-in-the-neck.

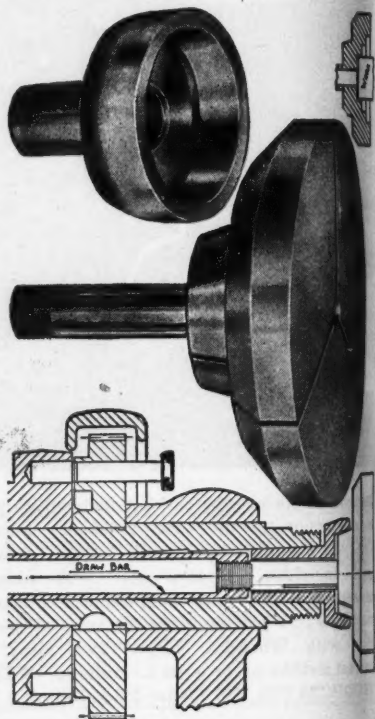
INVINCIBLE TOOL CO.

M-611 EMPIRE BUILDING
PITTSBURGH 22, PA.

Makers of Job Tested and Job Proven Tools

Installation of the chuck is quickly and easily effected. The hardened shank with its tapered shoulder extends through a closing sleeve attached to machine spindle by a drive fit and threads into drawbar which, when properly actuated, pulls the tapered shoulder of the chuck into the corresponding recess in the closing sleeve, the bored step in the head tightening on the work.

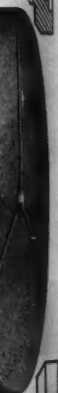
The unhardened chuck head can be bored to accommodate any size work



G.B.M. 4 1/2-Inch Collet Step Chuck

from 5/8 to 4 inches in diameter, and at least seven 1/8-inch steps can be bored in the head. Since each chucking step is bored using the same setup as for succeeding operations on the work held, concentricity is assured without indicating. For machines not having taper spindles suitable for a drive-fit closing sleeve, another type of sleeve is provided which can be screwed on the external threads of spindle.

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JOHNSON'S

Adjustable Limit SNAP GAGES



MODEL A



MODEL B



MODEL C

W. E. JOHNSON CO.

Keep down your gage costs by using these fast, accurate gages. Reset when necessary. Also: Flat and Cylindrical Plug Gages, Built-Up and Solid Snap Gages, Flush Pin and many other types of gages.

WRITE
FOR
DETAILS.

Factory:

Turnpike and Pequannock
Avenue
Pequannock, N. J.

LUMA

Patented



Combination Demagnetizer and Electric Etching Pencil. Marks symbols in hardest steel. Demagnetizes instantly.

One of our models popular in tool rooms for 15 years.

Luma Electric Equipment Co.
DEPT. MS TOLEDO 1, OHIO

TIME SAVER FOR QUICK CHANGE MARKING

- Fastest and simplest way to number parts.
- Easy! Just turn screw to change numbers.
- Made of best quality tool steel.
- Guaranteed for years of service.
- PROMPT DELIVERIES



STOCK TYPE

- # 1... BA 1864249
- # 2... BA 186429
- # 3... BA 1864

SOSSNER

161 Grand St. New York 13, N. Y.

WITH
HANDY
TYPE BOX



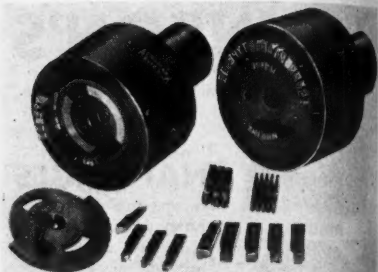
September, 1944

MODERN MACHINE SHOP 293

Acromark Interchangeable Stamping Type Holder

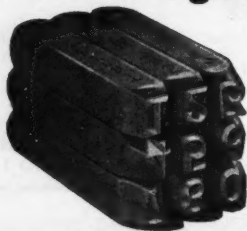
An interchangeable stamping type holder which is specially designed for stamping parts requiring several size characters on different radii has been introduced by The Acromark Co., 9 Morrell St., Elizabeth 4, N. J. For direct power press attachment, the holder is available with a punch shank to fit the press ram. Where use in standard die set is desired, the holder is provided with tapped mounting holes.

The Acromark Interchangeable Stamp-



Acromark Interchangeable Stamping Type Holder

Why THOR STAMPS Last Longer



... because they're made of a special, correctly-heated alloy steel. Central striking point assures uniform marking. Thumb side marking assures easy use.

You get more mark per dollar with THOR STAMPS. Write for catalog and prices.

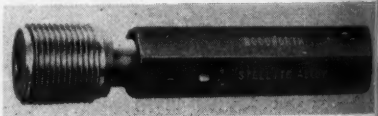
The Pittsburgh Stamp Co., Inc.

812 CANAL ST. • PITTSBURGH, PA.

ing Type Holder utilizes specially made duty segment style type. Simplified construction permits changing of type in any line by removal of only one screw. The shank and body of the holder are one piece to provide maximum strength.

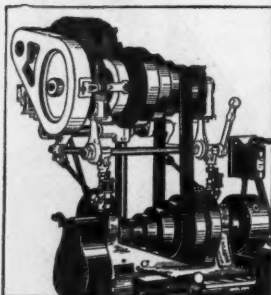
Woodworth Stellite Alloy Gages

Cylindrical and thread plug gages made of what is claimed to be the hardest, most wear resistant grade of



Woodworth Stellite Alloy 1" - 14 Thread Plug Gage

Stellite alloy are now being offered by the N. A. Woodworth Co., 1300 E. Nine Mile Rd., Detroit 20, Mich. In addition

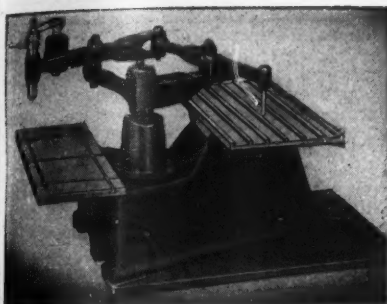


Remco brings QUIET

Smooth, quiet, vibrationless power is transmitted by Remco Motor Drives. The motor takes hold by gradually slipping the belt—simple friction clutch action. No noise. Speed changes made without removing tool from cut. No tool marks. Rigid three point suspension, instead of the ordinary one or two points. Drive easily installed, at very low cost. Write!

Remco Products Corp., State and Hay Sts., York, Pa.

REMCO MOTOR DRIVES
for LATHES, SHAPERS, DRILLS, MILLING MACHINES, ETC.



DUPLICATING and PROFILING **AUTO - ENGRAVER**

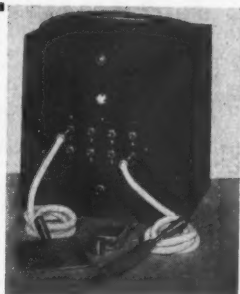
Accurate Engraving with Unskilled Operators

Unskilled operators will profile or accurately reproduce in smooth lines any design, number, letter, emblem; on iron, brass, copper, aluminum, soft steels and all plastics. Here are some of its other uses . . . Drills a series of holes, or profiles small parts. • Cuts an even channel for wiring on panels. • Increases accuracy and production. • Works from original drawing or templates. • Etches glass and similar items. • Will not cause distortion. For information and prices write Dept. M.

AUTO-ENGRAVER COMPANY

1776 Broadway, New York, N. Y.

**MARK
IRON,
STEEL
and
CARBIDES**



THE
Echograph
WAY

Original Electric Etcher

Mark hardened parts, tools, dies, gages and fixtures of any ferrous metals including the hardest alloys and carbides — quickly — plainly. • Three sizes to meet all requirements.

• Write for circulars and prices.

BREWSTER-SQUIRES CO.

Hudson Terminal Bldg. New York 7, N. Y.

SAVE TIME

ON BORING - TOOL SETTING

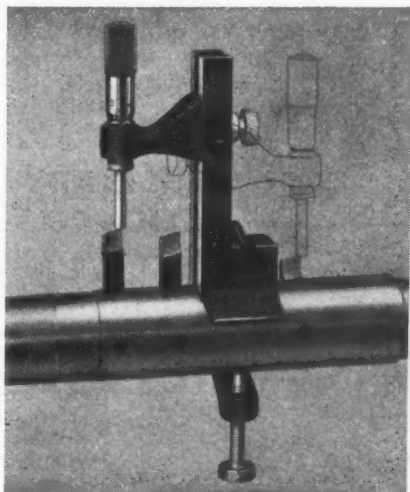
Take one trial cut, mike it, and use this gage to move the tool the exact additional amount required. Or, working from the O.D. of the bar, set the tool to exact position without a trial cut.

USE THE BARTELT PEDESTAL MICROMETER

Time wasted in conventional cut-and-try methods can be eliminated. Inexperienced operators learn to do satisfactory work more quickly. Three models available—Model B, with two-slide pedestal, shown.

USEFUL FOR MANY OTHER JOBS

Bartelt Pedestal Micrometers are also excellent for height and depth gaging, for inspection work of various kinds, and for other set-up operations. Write for circular giving full information.



BARTELT ENGINEERING CO.

1216-J Partridge Avenue

BELOIT

WISCONSIN

to its unusual resistance to abrasion, the new cobalt-chromium-tungsten alloy used in the manufacture of these gages is said to feature low coefficient of friction, low affinity for other materials, durability, coefficient of expansion, low coefficient of thermal conductivity, and stability, and to be noncorrosive and nonmagnetic.

Of AGD standard design, cylindrical and thread plugs up to and including $\frac{3}{8}$ inch O. D. are made solid, both gage members and shanks being cast solid Stellite. In order to conserve vital Stellite material and to reduce weight

as much as possible, gages above $\frac{1}{2}$ inch in diameter and including $1\frac{1}{2}$ inch in diameter are made of the bushing type with standard tapered steel shanks brazed to the Stellite bushings, resulting in practical and economical gages of otherwise AGD standard design.

Cylindrical and thread plugs over $1\frac{1}{2}$ inches and including 4 inches in diameter of AGD trilock design are available on special order. These gages comprise cast Stellite alloy bushings with aluminum inserts.



SAFETY FIRST

in throwing belts on or off moving pulleys on the line shaft by using the Red-E Safety First belt pole attachment. Made in two sizes. Stock delivery.



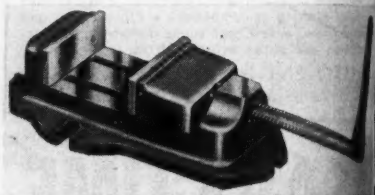
Write for
Catalog S-44

THE READY TOOL CO.

510 Iranistan Ave.
Bridgeport, Conn.

Jenkins Bar-Lok Heavy Duty Vise

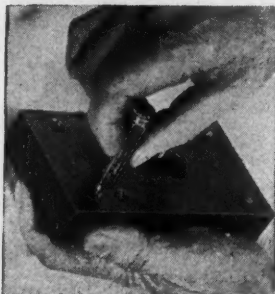
A fast-locking heavy duty vise to be known as the Jenkins Bar-Lok has been developed by the Mechanics Engineering Co., Jackson, Mich. The vise is set and released by means of a Bar-Lok



Jenkins Bar-Lok Heavy Duty Vise

push-pull pressure unit which has positive locking contact at four points and is designed to develop a pressure up to 20,000 lb. Only a quarter turn of the vise handle is required to lock and release work.

The Jenkins Bar-Lok Vise is precision built for heavy duty use around milling machines, drill presses, and other



A REAL HELPING HAND

It's a help that die makers, tool makers, machinery builders and general machinists have long sought—a more accurate and surprisingly faster way of transferring blind screw holes.



The Heimann Transfer Screw Set is a self-contained, complete tool. No wrenches or pliers are necessary. Made in $\frac{1}{8}$ " to 1" diameters. Send for price list.

HEIMANN MFG. CO.

330 Lincoln Ave.

Urbana, Ohio

IMPROVED BALANCING WAYS



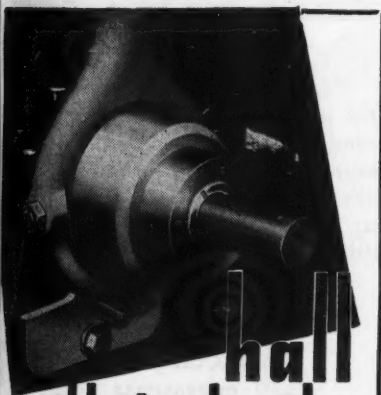
Four chilled iron discs rotate on special sensitive bearings. For balancing, straightening and trueing. Write for details.

| Swing | 20" | 40" | 60" | 72" | 96" |
|-------------------------------------|-------|-------|-------|-------|--------|
| Greatest Distance Between Standards | 20" | 30" | 30" | 44" | 88" |
| Capacity in lbs. | 1,000 | 2,000 | 2,000 | 5,000 | 10,000 |

ANDERSON BROS. MFG. CO.

1926 Kishwaukee St.

Rockford, Ill.



half collet chucks

All grip—no slip... no bearings, friction, heat or lost power... push out type... full spindle capacity or over... automatic adjustment... work re-set without stopping lathe... 2 sizes, 1" and 2" capacities... order now with proper priorities.

Immediate deliveries.

HALL MANUFACTURING COMPANY
Ph. NO 9679

622 Tularosa Dr.

Los Angeles 26, Cal.

PATCH FLOORS

Truck Over Immediately

**Just the Thing for
Busy Machine
Shops**

Here's a new, fast way to patch broken concrete without having to close off the area. Use durable **INSTANT-USE**... a tough, plastic material which you simply shovel into hole—tamp—and run traffic over immediately. **NO WAITING.** Bonds tight to old concrete. Makes smooth, solid, heavy-duty patch. Keep a drum on hand for emergencies. Immediate shipment.

Request Descriptive
Folder and Details
of

**FREE TRIAL
OFFER**



INSTANT-USE

FLEXROCK Co.

3615 Filbert St., Philadelphia 4, Pa.

Please send me complete **INSTANT-USE** information... details of **FREE TRIAL OFFER**—no obligation.

Name.....

Company.....

Address.....

above 1/2 inch
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September, 1944

MODERN MACHINE SHOP 297

equipment where severe vibration is encountered. The vise, which has a 4-inch opening, is $3\frac{1}{2}$ inches high and is provided with jaws $1\frac{1}{8}$ x $4\frac{1}{4}$ inches.

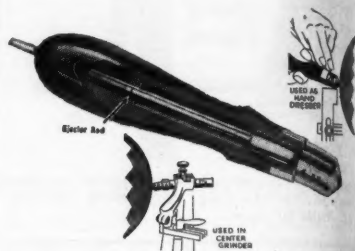
"Precisionplate" Chromium Bonding Method for Thread Gages

A method of uniformly and adhesively bonding chromium to the full thread form on a thread gage is now being marketed by The Sheffield Corp., Dayton 1, Ohio, under the trade name of "Precisionplate." The method is said to be such that the adhesion, toughness, and thickness of the chromium can be controlled to a very fine degree of precision.

Gages finished by the Precisionplate method are claimed to feature increased resistance to corrosion caused by handling or atmosphere, as well as chipping, scoring, marring, and other damage due to rough handling. Precisionplate thread plugs are available in standard sizes having an accuracy of Class X tolerance in lead, angle, and pitch diameter. Special Precisionplate plugs can be made to order.

"Handi-Nib" Double Duty Diamond Dressing Tool

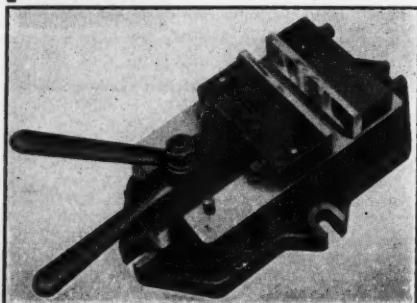
Diamond Tool Co., 953 E. 41st St. Chicago 15, Ill., announces a diamond dressing tool, known as the "Handi-Nib," which can be used for both hand



"Handi-Nib" Double Duty Diamond Dressing Tool

and machine dressing. The tool consists of an ejector type handle in combination with a "Big-Hed" diamond which is held firmly in the handle for use on steady rest of grinder wheel

HARTFORD 4 Point MILLING VISE



This powerful milling vise is provided with a cam handle for rapid closing and opening in combination with an eccentric handle for locking. Both handles can be operated with a single hand.

- ★ POWER
- ★ SPEED
- ★ ACCURACY
- ★ STRENGTH

Write for further details.

**THE HARTFORD
SPECIAL MACHINERY CO.**
HARTFORD • CONNECTICUT

Duty
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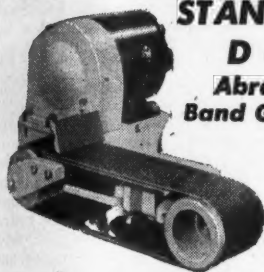
Y CO.
RECTICUT

September, 1944

STANDARD

D - 4

Abrasive Band Grinder

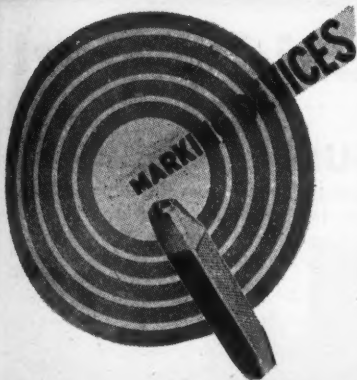


This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x36 1/4" band. The ideal portable unit.

OTHER STYLES AND SIZES IN NEW
BOOKLET ON FINISHING—WRITE TODAY

WALLS SALES CORP.

96 Warren St., New York, N. Y.



TYPE HOLDERS AND TYPE . . . ROLL MARKERS
HAND STAMPS LOGOTYPES DIES STANDARD
AND SPECIAL STAMPS INSPECTORS' STAMPS
MACHINE ENGRAVING PRECISION DUPLICATING

NEW METHOD STEEL STAMPS, Inc.

149 Joseph Campau, Detroit 7, U.S.A.



AIR CONTROL is the Secret of precision tapping The Haskins Way

Accuracy—to a class 4 fit when necessary—is constant—each part is tapped exactly like every other, independent of operator efficiency. AIR regulates the complete tapping cycle—not only the down stroke, but its control is so sensitive that the tap is allowed, in effect, to float out of the part. Tap life is longer—tap breakage practically eliminated. Send today for your copy of catalog on Tapping—The Haskins Way. R. G. Haskins Co., 620 South California Avenue, Chicago, Illinois.



haskins

PRECISION TAPPING EQUIPMENT

By rolling the nib across the face of the wheel at a slightly inclined angle, an excellent dress is said to be obtained.

To release the nib for use in the adapter of a Norton center grinder or any other machine accommodating a $\frac{1}{8}$ -inch shank nib, the operator merely holds the handle and presses down on the ejector rod, whereupon the nib pops loose from the handle. When further use as a hand tool is required, the nib may be pressed by hand back into the handle socket.

The Handl-Nib Double Duty Diamond Dressing Tool is available with resettable nibs containing diamonds in sizes of 2 carats and larger.

"Super Temp" Hardening Solution

As a companion to its "Steel Temp" hardening solution, the Steeltem Chemical Co., 51 E. 42nd St., New York 17, N. Y., has placed on the market a hardening solution for extra super hardness, known as "Super Temp." According to the manufacturer, this solution is especially recommended for friction wearing parts of industrial machinery and high speed steel tools that oper-

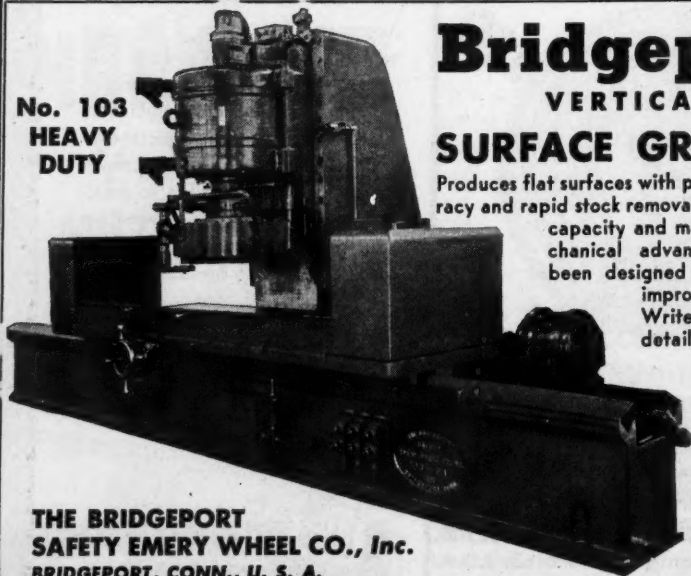
ate with uniform or rotary motions, imparting instant maximum hardness considerably beyond that obtainable by quenching in Steel Temp hardening solution.

A distinctly different analysis from Steel Temp hardening solution, Super Temp is said to be ideal for the quenching of high speed steel bits, reamers, broaches, twist drills, milling cutters, taps, hobs, saw blades, boring tools, end mills, keyway cutters, and other high speed steel tools, as well as gears, shafting, bolts and numerous other friction-wearing parts. It is not recommended for impact tools since the great hardness resulting from quenching in Super Temp may, it is stated, impair the safety of concussion tools that are subjected to severe shocks and blows.

"Saw-Chief"

An attachment for electric drills that is said to provide a portable power saw and file, to be known as the "Saw-Chief," has been announced by the Chicago Precision Equipment Company, 919 N. Michigan Ave., Chicago, 11, Ill.

**No. 103
HEAVY
DUTY**



Bridgeport VERTICAL SURFACE GRINDER

Produces flat surfaces with precision accuracy and rapid stock removal. Large table capacity and many other mechanical advantages have been designed into this improved grinder. Write for complete details.

**CATALOG
ON
REQUEST.**

**THE BRIDGEPORT
SAFETY EMERY WHEEL CO., Inc.
BRIDGEPORT, CONN., U. S. A.**

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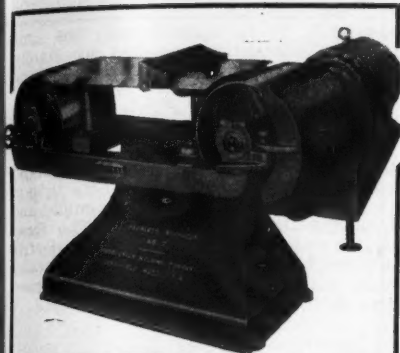
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CATALOG
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REQUEST.

September, 1944



PEERLESS ABRASIVE BELT SURFACERS

For speed and quality in grinding flat surfaces of metal, wood, hard rubber, celluloid and plastics. Can be furnished in both vertical and horizontal type—9", 14", 20" sizes.

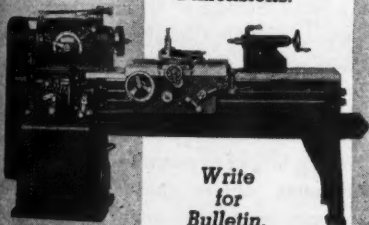
Other Horizontal and Vertical types for flat or round work can be furnished.

PRODUCTION MACHINE CO.
GREENFIELD MASS.

CARROLL AND JAMIESON LATHES 15" AND 16"

12 Speed Geared Head Motor Drive Timken Mounted Spindle.

Modern Design—Liberal Dimensions.



Write for Bulletin.

THE CARROLL & JAMIESON MACHINE TOOL CO.
DETROIT, MICH. U.S.A.

BURKE MILLING MACHINES



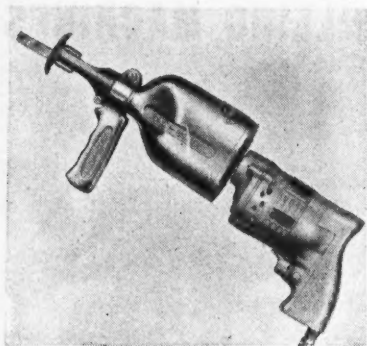
No. 4 Motor Driven MILLING MACHINE Mounted on Cabinet Column

Burke motor driven milling machines Nos. 1, 2, 3, and 4 are specially suited for handling small, difficult work on a production basis.

Write for complete information.

BURKE MACHINE TOOL CO.
297 E. 16th St. Conneaut, Ohio

The Saw-Chief is said to rapidly saw into every kind of metal, casting or rod, plastics, and other materials, by placing



"Saw-Chief"

an ordinary hack-saw blade in the holder with the teeth toward the operator. The device may also be converted into an automatic file by simply inserting a file in the same chuck or holder. Moreover, where electric power is not

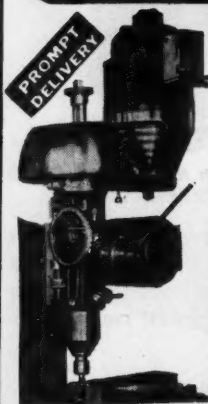
available, it is claimed that the unit can be efficiently propelled by simply attaching it to a compressed air line or flexible shaft.

The manufacturer states that the inner mechanism of the Saw-Chief is of balanced ball bearing construction, built for heavy-duty cutting and to withstand hard use. A pistol-grip handle is said to permit the operator to guide and hold the device with ease. The Saw-Chief may be attached to any electric drill with a $\frac{1}{4}$ -inch chuck and is obtainable with or without heavy duty electric drill.

Ashcroft Duraswitch

The Electro Mechanical Division, Manning, Maxwell & Moore, Inc., Bridgeport 2, Conn., announces the Ashcroft Duraswitch—a sturdy, dependable switch in combination with Ashcroft gage. The gage has a slide rule dial which is easily readable for accurate adjusting of the switch to control point. This unique combination of switch and gage is said to provide for saving of space on equipment on which

MILLING · DRILLING · BORING ATTACHMENT for Heavy Duty Operations



PROMPT
DELIVERY

EASY MOUNTING

LARGE QUILL—
4" TRAVEL
(counter balanced,
hardened, and ground)

6 SPEEDS,
250-3000 RPM.
Lever and Worm Feed:
 $\frac{1}{2}$ H.P. Motor

Specially engineered by RUSNOK to meet the demand for heavier duty end mill operations. Uses many types of cutters on a wide range of work. Large size spindle (No. 9 B & S taper). Takes $\frac{1}{8}$ " to $\frac{3}{4}$ " end mills. Precision Engineered and Ruggedly Constructed Throughout.

Write for descriptive folder.

RUSNOK TOOL WORKS
4840 North Avenue, Chicago, Ill.

Gear Specialties

SPURS — HELICALS (14 to 96 D.P.)

BEVELS — (straight and spiral)

WORM GEARING — THREAD GRINDING

As manufacturers of high precision small gears for numerous vital controls used in this highly mechanized war, we are literally "swamped."

Therefore, under existing conditions, we are forced to minimize further commitments unless they have W.P.B. urgency support.

Gear Specialties

MANUFACTURERS
CHICAGO

BRADFORD METALMASTER LATHES

14½" - 16½" - 18½" Swing

TOOLROOM AND ENGINE TYPES

.. Also ..

CAM FEED
UNIT TYPE
DRILLING AND
TAPPING
MACHINES



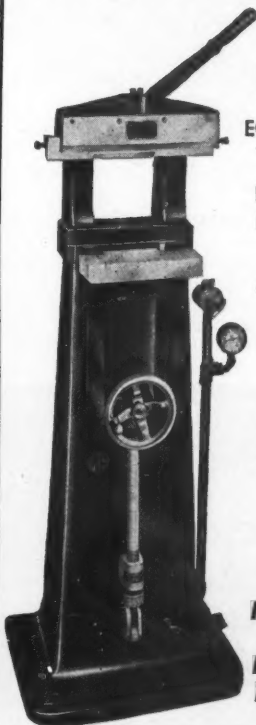
1840 - 1944

The Bradford Machine Tool Co.

Evans at 8th St.

Cincinnati 4, Ohio

QUICK MARKING FOR PART NUMBERS



MARKING
BY ROLLING
IS FAST AND
ECONOMICAL.

PRESERVES
DIE LIFE AND
PIECE PARTS.

REQUIRES
ONLY FRACTION
OF
APPLIED
PRESSURE
AS COMPARED
TO
STAMPING.

QUICK
SET-UPS

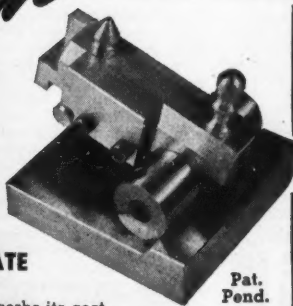
MODEL 25
HI-DUTY
MARKING
MACHINE

This machine operates from your plant air line, and is one of numerous models built to produce fast, neat marking on metal parts. Hi-Duty marking machines may be had for practically any marking operation, and we will be glad to make recommendations upon receipt of your inquiries. Send prints or samples of parts to be marked, showing lettering and location, also state required production.

GEO. T. SCHMIDT, Inc.

1806 BELLE PLAINE AVE.
CHICAGO 13, ILLINOIS

Since **ANGLE
WHEEL DRESSER**



Pat.
Pend.

**FASTER
EASIER
FAR
MORE
ACCURATE**

Quickly absorbs its cost in a speedy, accurate dressing of surface grinder wheels. Angles from 0° to 90°. A precision diamond tool. Write for Bulletin 758K.

Made by Florian Mfg. Co., Plantsville, Conn.

ORDER THROUGH
AMERICAN STANDARD CO.
MIDDLETOWN, CONNECTICUT

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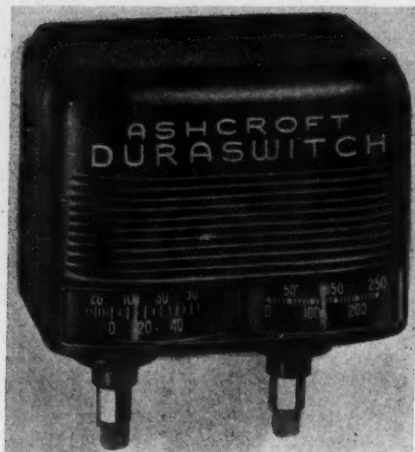
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September, 1944

MODERN MACHINE SHOP 303



Series E-200 Ashcroft Duraswitch

unit is installed and also eliminate the need for extra fittings.

The Series E-100 Duraswitch is for pressure applications only, while the Series E-200 Duraswitch, which is avail-

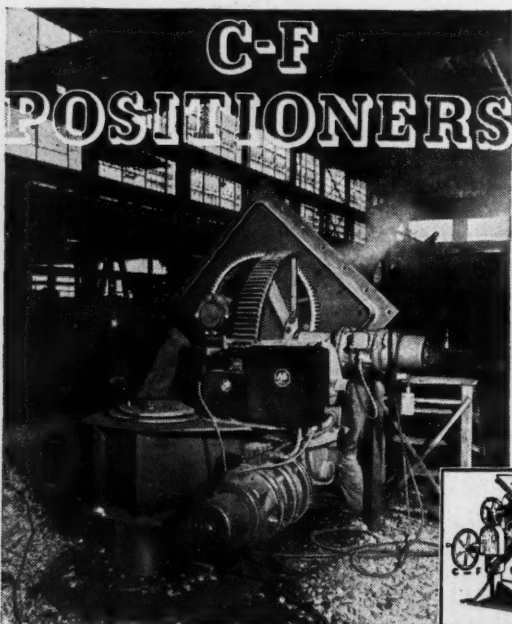
able in single and duplex types, can be used for both pressure and temperature applications.

Dearborn Model C Chucking and Indexing Fixture

Designated as the Model C, a chucking and indexing fixture for use on milling and drilling machines has been placed on the market by J. W. Dearborn, Ansonia, Conn. The fixture can be placed in three positions on the milling machine table and swung to all angles.

Work is centrally held, regardless of variation in size, by draw-in collet which will take up to and including 1/2-inch round. Hexagon, square, or other shaped workpieces can be held by using special collets. Collet is opened and closed automatically by the forward and backward motion of the milling machine table, and can be instantly changed by releasing latch on top of nose piece and turning the collet to the left 90 degrees.

Indexing is done when the work is just back of the cutter and before the



Photographed at
Clearing Machine Shop

A Better Job More Safely Done

C-F Positioners permit more welding in the same time, more safely, save crane and sling crew time, save floor space. It's stronger, better welding, too — uniformly stronger joints, and smoother, neater fillets and beads which eliminate excessive grinding. Permit you to make downhand welds on all sides, surfaces and angles with a single setup, to use large rods that require fewer passes. Table revolves 360°, tilts to 135° beyond horizontal—adjustable for height. C-F Positioners are provided in capacities to 30,000 lbs. hand or push-button control operation. Table rotation from 0 R.P.M. up. Pedestal or boom mounted to give maximum floor and working clearance.



Write for Bulletin WP-22

CULLEN-FRIESTEDT CO.
1311 So. Kilburn Ave.,
Chicago 23, Ill.

ROtARY FiLES



HAND

CUT

CUT TIME

ALL SHAPES
Cuts & Sizes



Write for Catalog

MECHANICAL DIE & TOOL CO. Inc.
11 New York Ave., Brooklyn, N. Y.

It's the "TOOTH-SET"
that makes STAR
the fast-cutting
blade



The secret of fast, accurate metal cutting with a hack saw blade lies in the "set" of the teeth. CLEMSON has developed a scientific method of toothing and

setting the teeth in STAR blades so that they give a clean, smooth, even cut, reducing the necessity for added filing or machining of the piece cut.

STAR blades are heat-treated in automatic electric furnaces where control is governed by a formula previously decided by exhaustive study and experiment. This produces a blade that is hard, tough, free from brittleness and guaranteed to give long, efficient service when used and cared for properly.

HARGRAVE Clamps



War plants are taking practically our entire output of clamps—and gaining increased efficiency and improved results. See your supplier—he'll do his best to help fill your needs.

Stock sizes range from $\frac{3}{4}$ " to 10" deep. A complete line in all patterns and sizes.



THE CINCINNATI TOOL CO.

Founded in 1879

1947 Waverly Ave., Cincinnati 12, Ohio

The CINCINNATI TOOL CO.

You need this valuable
"Metal Cutting" Guide

That's just what it is—a pocket size manual of instructions on the selection, use and care of hack saw blades. You'll find it worth sending for. And it's FREE.

CLEMSON BROS., INC.
MIDDLETOWN, N. Y.



STAR

HACK SAW
BLADES



CLEMSON

Makers of Hand and Power Hack Saw
Blades, Frames, Band Saw Blades,
and the Clemson D-17 Lawn Machine.

MODERN MACHINE SHOP 305

September, 1944

is any tension on the operating chain. Adjustable stop in handle provides each indexing position. The work is automatically ejected from the collet after



Dearborn Model C Chucking and Indexing Fixture

the last cut by bringing milling machine table back a little farther than usual.

In brass or free-machining steel, over 1,500 light cuts can be milled per hour through the use of the Model C fixture. To mill taper on workpiece, the fixture is tipped the required number of degrees

on the milling machine bed and straight cutter used.

Specifications of the Dearborn Model C Chucking and Indexing Fixture are as follows: collect capacity, $\frac{1}{2}$ -inch round; height to top of collet 3 inches; center of collet to back of fixture, 2 inches.

G-E Formex Wire

Formex ribbon-rectangular magnetic wire in shapes as thin as 0.004 inch is now available from the General Electric Co., Schenectady, N. Y. Smooth, strong, flexible, and able to withstand high speed winding without damage to insulation, the Formex wire is said to offer many application possibilities to producers of electronic devices and other electric components.

In coil winding, varnish treatment assembly, and actual operation, G-E Formex Wire presents many advantages. Its final dielectric strength is judged by its reaction to abrasion during winding, and the wire's resistance to abrasion, heat-shock, and solvents is claimed to be unusually great.

NICHOLSON E-x-p-a-n-d-i-n-g MANDRELS

Solve the Problem of Handling a Maximum of Bores with a Minimum of Mandrels . . .



| TYPE | Size No. | Range of Bores Taken | Net Price |
|----------------------------|----------|------------------------|-----------|
| A STEP JAW DESIGN | 1A | $\frac{1}{2}$ " to 1" | \$12.00 |
| | 2A | 1" to $1\frac{1}{2}$ " | 16.00 |
| | 3A | $1\frac{1}{2}$ " to 2" | 23.00 |
| | 4A | 2" to 3" | 34.00 |
| | 5A | 3" to 4" | 40.00 |



TYPE A MANDRELS are recommended for a large range of bores with few mandrels. Only five mandrels, each with one set of three jaws, hold work with all bores from $\frac{1}{2}$ " to 4". No. 1A has jaws with three steps, larger size have jaws with two steps. Can be used in hexagonal broached holes as well as round.

Write for Bulletin 1043.

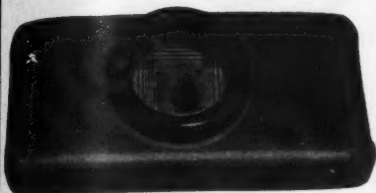
W. H. NICHOLSON & CO., 136 Oregon St., Wilkes-Barre, Pa.

TYPE B—STRAIGHT JAW DESIGN

| Size No. | Range of Bores Taken | Net Price |
|----------|--------------------------------------|-----------|
| 1X | $\frac{1}{2}$ " to $\frac{3}{8}$ " | \$10.00 |
| 2X | $\frac{3}{8}$ " to $2\frac{1}{32}$ " | 11.00 |
| 3X | $2\frac{1}{32}$ " to $\frac{1}{2}$ " | 12.00 |
| 00 | $\frac{1}{2}$ " to $\frac{3}{4}$ " | 14.00 |
| 0 | $\frac{3}{4}$ " to 1" | 16.00 |
| 1 | 1" to $1\frac{1}{2}$ " | 18.00 |
| 2 | $1\frac{1}{2}$ " to $1\frac{3}{4}$ " | 21.00 |
| 3 | $1\frac{3}{4}$ " to 2" | 24.00 |
| 4 | 2" to $2\frac{1}{2}$ " | 27.00 |

Other Sizes Taking Up to 7" Bore
TYPE B MANDRELS have longer gripping surface, and accommodate longer, heavier work. 14 sizes will accommodate all bores from $\frac{1}{2}$ " to 7". The smaller sizes require only one set of jaws, intermediate sizes two sets and larger sizes three sets. Each consists of four jaws. For round holes as well as round.

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The FELL Precision Level is made to show the level of all ways at once. This eliminates disturbing the first level when leveling the second. Graduations are in .0005" per foot and form squares about a circular bubble, thus giving co-ordinate readings and showing direction and amount of slope, if any.

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 $5\frac{1}{2}" \times 12"$ $3\frac{1}{2}" \times 6"$

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Nobur Foot Control Unit

A foot control unit for use with Nobur burr-removing tools is announced by the Nobur Mfg. Co., 908 N. Orange Drive, Los Angeles 38, Cal. Designed to provide for easier and faster operation of these tools, the foot control unit is said to enable the operator to work more efficiently and to eliminate fatigue by allowing operator to work in a position and at an angle most comfortable and convenient for him.

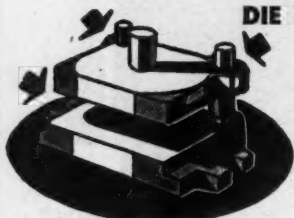
With the Nobur Foot Control Unit,



Nobur Foot Control Unit applied to machine especially adapted to Noburring

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any drill press, it is claimed, can be readily converted into an efficient machine specifically adapted to Noburring. The unit is said to provide an easy means for actuating the movement of the burring blade by foot pressure, allowing operator free use of both hands for handling parts.

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Designated as the PMCR O-1, an air-operated rocker arm spot welder for production sheet metal work is an-

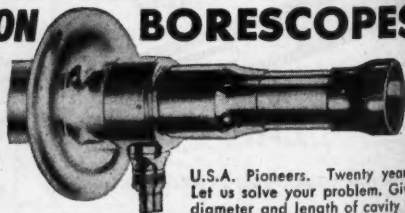
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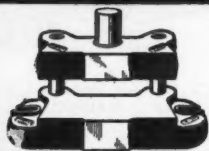
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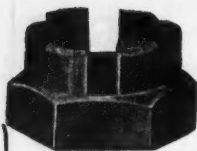
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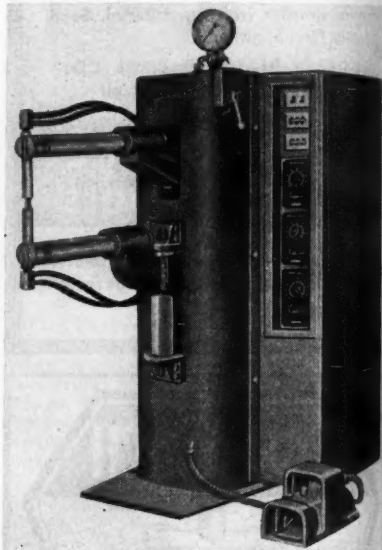
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nounced by Sciaky Bros., 4915 W. 78th St., Chicago 38, Ill. Entirely self-contained, this relatively small unit is said to include features usually found only on larger machines.

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Sciaky PMCR O-1 Air-Operated Rocker Arm Spot Welder

erator. Current interruption may be effected either magnetically or by ignitron tubes.

The Sciaky PMCR O-1 Rocker Arm Spot Welder is fully automatic in operation, with controls provided for welding heat, duration of current, cool period, and off period. Rated 30 kva at 50 per cent duty cycle, the machine has a capacity for clean mild steel of from two thicknesses of 0.016 inch up to and including two thicknesses of 0.080 inch—stainless steel up to a maximum of 0.040 inch plus 0.040 inch. Welding speed on two thicknesses of 0.032-inch pickled mild steel is 180 spots per minute. Electrode pressure at 24-inch throat depth is 1,000 pounds.

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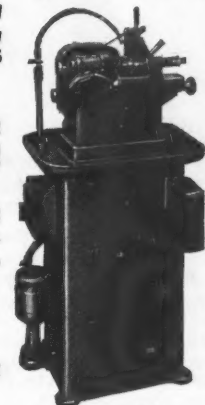
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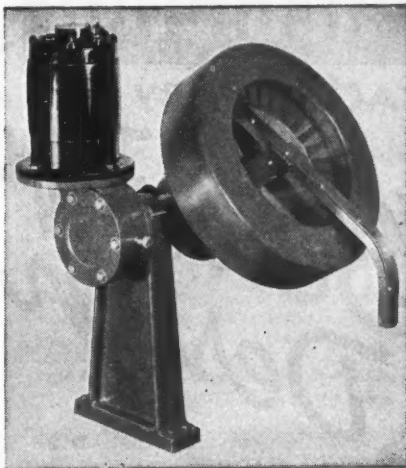
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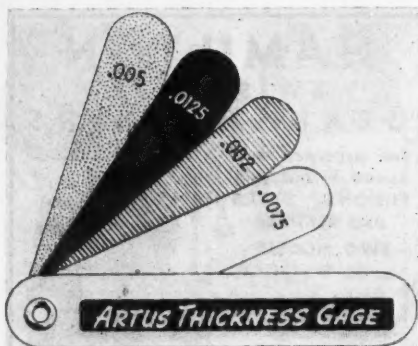
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Artus Plastic Thickness Gage

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Smalley-General No. 44 MB "Master" Thread Miller

The Smalley-General Co., Bay City, Mich., has brought out a heavy duty thread miller for milling large as well as long threads per inch. Designated as the No. 44 MB "Master," the machine, for instance, can be used to mill 0.8 pitch threads ($1\frac{1}{4}$ threads per inch), 18 inches diameter, $12\frac{1}{2}$ inches long. This is done by using a multiple ring tooth cutter or a single cutter as desired.

The No. 44 MB has a nominal swing over ways of 44 inches and is provided with an $18\frac{1}{2}$ -inch hole through the spindle. The accompanying illustration shows the machine equipped for milling gun tubes for 4.7 guns, 8-inch Howitzers, and 155 mm. guns and Howitzers. To mill the breech rings, it is only necessary to remove the faceplate from the front end of the main spindle and attach a pot chuck. A steady rest bearing for supporting the rear end of a long gun tube can be supplied where the overhang is excessive. The machine is said to be suitable for any kind of heavy or large work. Larger bores for the main spindle can be arranged

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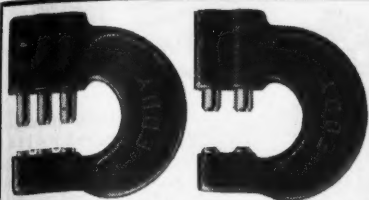
Smith Master Plates are built to hold their precision. Notice the sturdy, deep-ribbed, thoroughly engineered under-structure, which supports the precision-lapped working surface. For long-lasting, highest precision, you want Smith Master Plates. Both surface and lapping plates available—many sizes from stock.

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EDDY SERVICE GAGE STYLE 22

Each gage, with complete set of gaging rods in case to gage

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| Between 0" and 3/4" (8 rods) | Net \$18.00 |
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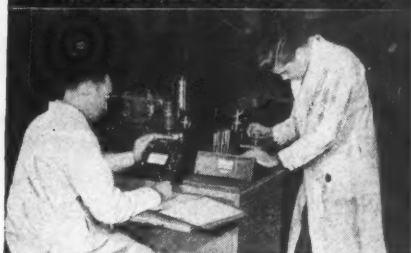
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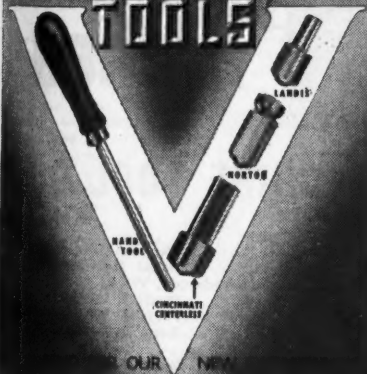
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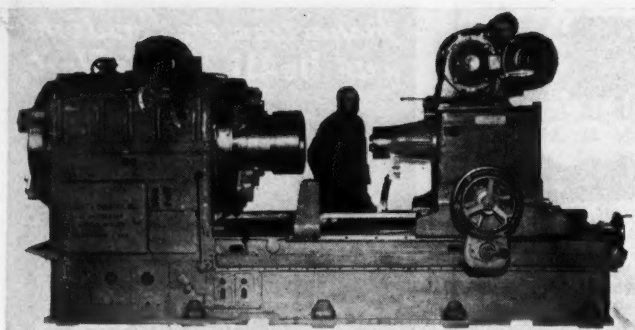
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September, 1944

MODERN MACHINE SHOP 313



Smalley-General No.
44 MB "Master"
Thread Miller

are both mounted in tapered roller bearings. Gearbox of the machine includes ample size gears which operate in oil, and all shafts are mounted on tapered roller bearings. The main spindle is driven by a worm and gear

if necessary.

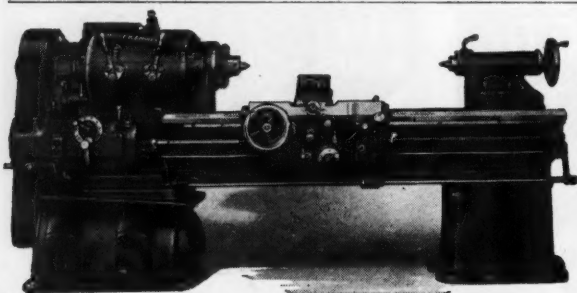
The milling spindle can be rotated at any milling speed from 4.5 to 120 minutes per revolution. Turning speeds 125 times faster than the milling speed can be instantly obtained. The milling spindle can be operated at any speed between 33 and 100 r. p. m. and can be easily arranged for speeds up to 200 r. p. m. A large taper in the end of the main spindle provides for use of a very rigid arbor.

The main spindle and milling spindle

which operate in heavy oil. The milling spindle is also driven by a worm and gear. Motors for both spindles drive through V-belts.

The bed of the No. 44 MB is a heavy fabricated structure with renewable ways that are automatically oiled. A pan which is designed to hold an ample supply of coolant is included as a part of the bed. A large coolant pump provided supplies a liberal amount of cutting fluid to the work.

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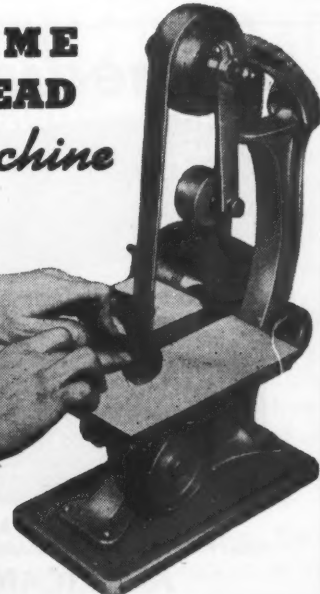
New circular explains, illustrates 18 ways in which the Mead Industrial Burring Machine saves time and money—also contains special Grit Guide. Every industrial plant needs this "Jack-Of-All-Trades" machine. Your burring can be done in "free time" — install these machines by every machine tool which leaves burrs. Grinds, finishes both outside and inside cut-out openings. Immediate delivery in most cases. Write for the informative Money-Saving circular now.



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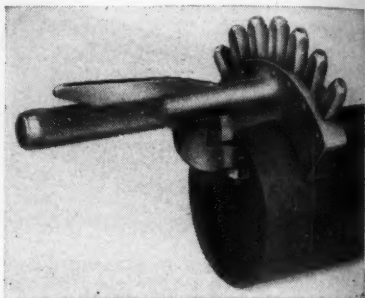
the machine through the use of Vickers pump (mounted on base under gearbox) and valves. Feed mechanism of the machine is of the well-known Smalley-General design which allows for milling from 1 to 14 threads per inch. All electric controls of the unit are flush mounted and feature oilproof wiring. Motors are wired so that if one motor stops during the cut, both will stop, thus preventing damage which might result if the milling head motor stops. The motors can, however, be operated independently.

Adaptable for either conventional or climb milling, the Smalley-General No. 44 MB Master Thread Miller weighs approximately 26,000 lb. with motors.

Cunningham Safety Peripheral Marking Holder

A safety peripheral marking holder for stamping around the outer circumference of tubing has been developed by the M. E. Cunningham Co., 158 E. Carson Sta., Pittsburgh, Pa. The holder is of all-welded design, and the characters are constructed of Cunningham

"Safety" steel to ensure maximum protection and service. The holder features a hand grip lock and is equipped

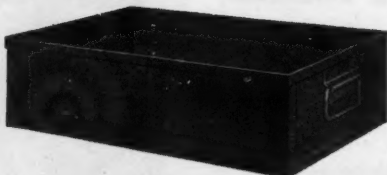


Cunningham Safety Peripheral Marking Holder

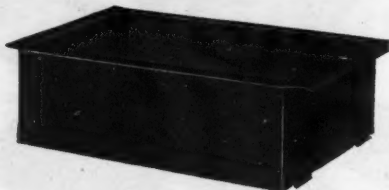
with a pointed screw which holds the unit firmly in position during marking operation.

Assuring clean, even impressions, the design of the Cunningham Safety Peripheral Marking Holder eliminates need for separate handling of each character

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A straight side shop box with drop handle each end. Excellent for shop use where stacking feature is not required.

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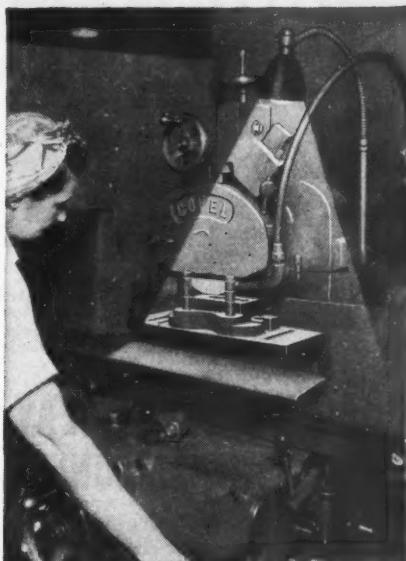
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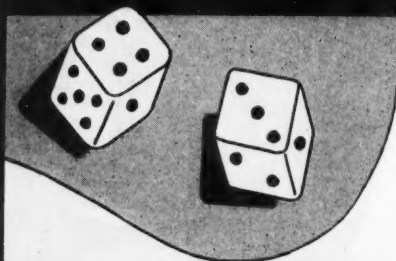


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PRODUCTION DELAY COSTS REAL MONEY!

When any machine goes "Down for Repairs" your production "Jams Up." To get that machine running again may cost only a few hours delay, but—the production lost can mean thousands of dollars.

Loss of Profits and Loss of Production Can Never Be Made Up!

Invincible angle tool attachments greatly reduce loss by reaching broken parts without dismantling the machine.

Invincible angle tool attachments make your portable drills universal for any operation by converting them into angle tools in a few minutes.



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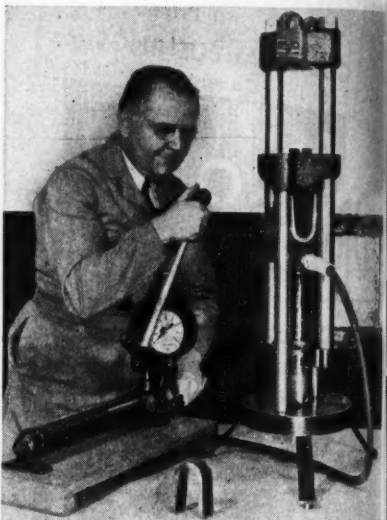
6111 Empire Bldg., Pittsburgh 22, Pa.

Makers of Job Tested and Job Proven Tools

and allows for marking around the ends rather than along the length of tubes. The holder is available with any reasonable number of characters.

Airco Portable Tensile and Guided Bend Weld Testing Machine

Introduction of a portable weld testing machine for making (1) Reduced Section Transverse Tension test, (2) Guided Bend Test (a completed 180-



Airco Portable Tensile and Guided Bend Weld Testing Machine

deg. face or root bend), and (3) Longitudinal All-Weld Metal Tension test (0.050 inch) is announced by Air Reduction Sales Co., 60 E. 42nd St., New York 17, New York.

Outstanding features claimed for the machine are its ability to provide accurate data on tensile strength and ductility of weld specimens, as determined by the three tests, and its relatively light weight which enables users to perform weld tests right on the job. This latter feature is said to make the machine particularly applicable to pipeline installation, construction, and similar jobs performed in remote locations.

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Guided
Machine

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Bend Weld

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T. H. LEWTHWAITE MACHINE CO.



FRONT LEVER BENCH PUNCH
Capacity $\frac{1}{4}$ " holes through $\frac{1}{4}$ " steel. Can also be made for holes up to $\frac{1}{8}$ " in thinner metal. Stock punches and dies available from $\frac{1}{16}$ " to $\frac{1}{4}$ " by 64ths. All parts interchangeable. Weight 70 lbs.

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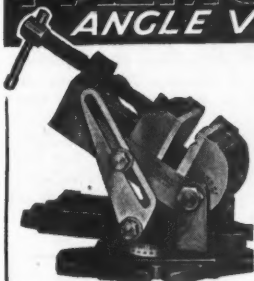
75% through use of the
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Clamp directly over
work. For use on all
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Standard and Heavy-
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- Write for circular R-9 "101 Angle Operation" and complete line of **PALMGREN Vises**.

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Automatic

CHUCKING and INDEXING FIXTURES

For Fast Milling and Drilling

Model C was designed to meet the demand of faster machining and accurate indexing of small pieces on bench and hand milling machines.

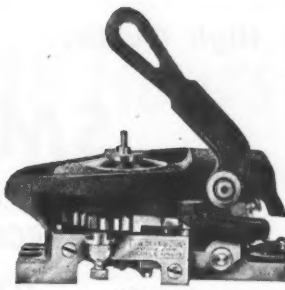
SPECIFICATIONS:

| | Model B | Model C |
|--|-------------------|-----------------------|
| Height to top of collet | 5 $\frac{1}{2}$ " | 3 $\frac{1}{2}$ " |
| Center of collet to back of fixture | 3 $\frac{1}{4}$ " | 2" |
| Collet capacity | 1" round | $\frac{5}{8}$ " round |
| Cuts per hour on free machining material | 1000 | 1500 |

Work held by automatically opening and closing collets. Work automatically ejected. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces.

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J.W. DEARBORN ANSONIA, CONN.



MODEL C



MODEL B

September, 1944

MODERN MACHINE SHOP 319

The Airco Portable Tensile and Guided Bend Weld Testing Machine operates on the principle of the hydraulic jack, a hand-operated pump transmitting pressure through a hose to the plunger of the unit. While the maximum direct load is 40,000 lb., the use of reduced section specimens allows for tests on metals of 150,000 p. s. i. or higher tensile strength.

Jaws for making the Transverse Tension test and plunger and die for the Guided Bend test are supplied with the machine. Jaws for the Longitudinal All-Weld Metal Tension (0.050-inch)

test are furnished on special order. All standard equipment is supplied packed in an oak cabinet with handles at both ends to facilitate carrying.

Invincible Boiler Tube Expander-Driver

As a result of the difficulty encountered in reaching many spots in present-day boilers with tube expanders

**DRILL and
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BUSHINGS
Frictionless
—Rotary**

For core drilling, T. C. and high speed boring, turret tool, piloting, etc. Won't stick or clog. Dust proof as a watch.

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1312 Mt. Elliott Ave. Detroit, Mich.



Invincible Boiler Tube Expander-Driver

driven by portable drills, flexible shafts or similar driving units, the Invincible Tool Co., 6111 Empire Bldg., Pittsburgh 22, Pa., has developed an angle tool attachment, known as the Invincible Boiler Tube Expander-Driver, which is said to provide the link between the tube expander and the driving unit.

High Quality

Quick Delivery

SMALL PINS

**VOLUME PRODUCTION BY OUR
SPECIAL NEW TYPE EQUIPMENT**

.030" to .125" Diam.

.125" to 2" Length

**SMOOTH ENDS—CLOSE LENGTH TOLERANCES—CONCENTRIC
CHAMFERED OR FORMED ENDS—HARDENED AND GROUND,
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DRILL THESE HOLES

BY A QUICK, EASY, INEXPENSIVE METHOD

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WATTS BROS. TOOL WORKS
Wilmerding, Pa.

Accurate Hole Transfer Made Easy With NIELSEN TRANSFER SCREWS



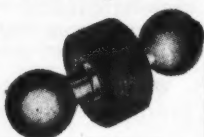
Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 7 sizes U.S.S. Inexpensive — Last for years. Write for Circular.

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1. Ball handles give exact weight and balance needed.
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making access to "hard-to-reach" spots easy.

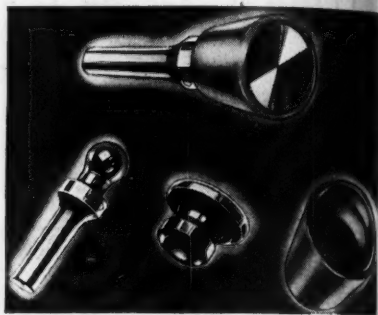
Ruggedly built for heavy duty service, the Invincible Boiler Tube Expander-Driver can be used to run nuts, studs, and bolts on and off in close quarters and is available with square or hexagon spindle and square, hexagon, or Morse taper shank. Special models can be designed to meet individual requirements.

Emerson Swivel-Type Flush Riveting Set

A swivel rivet set which is especially designed for high speed flush riveting on irregular or slightly curved surfaces is announced by the Emerson Engineering Co., 1418 S. Flower St., Los Angeles 15, Cal. Constructed for easy use by inexperienced operators, the set consists of only three parts—head, shank and rubber retainer—and can be assembled or disassembled quickly by hand.

The swivel action provided by the unit allows for riveting at various angles up to 20 deg., while the protec-

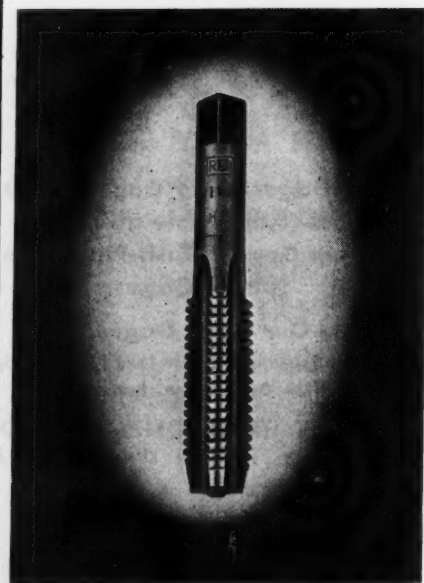
tive rubber retainer of the set is said to prevent skidding or danger of surface marring. Ample face surface and



Emerson Swivel-Type Flush Riveting Set

high polish assure smooth, skin finish, it is claimed.

The Emerson Swivel-Type Flush Riveting Set has a 1½-inch face and an overall length of 3 inches, and is available with either 0.401 or 0.498-inch shank.



REIFF & NESTOR TAPS

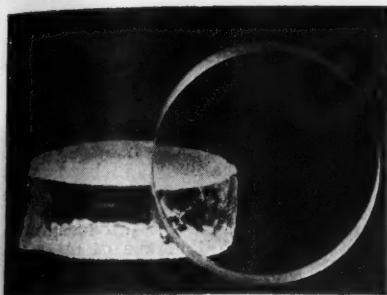
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DIX-WILDER TOOLS

Here are two real production boosters for surprising increases in both output and accuracy.

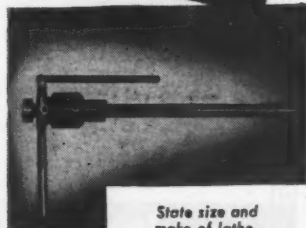
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• Increases efficiency of both skilled and unskilled workers—reduces scrap—increases output up to 100%—4 accurate indexed positions. Price for 9, 10, 12 inch lathes \$12.50; larger sizes in proportion.

AUTOMATIC COLLET CLOSER

• Fits lathes with $\frac{3}{4}$ " spindle hole—accommodates 1-A collets. Positive locking—ball bearing adjustment—no sleeves—no pins—no liners—rust proofed—quickly installed. Price \$50 complete. Immediate delivery, AAS priority reg. on both. Send for ill. Catalog.

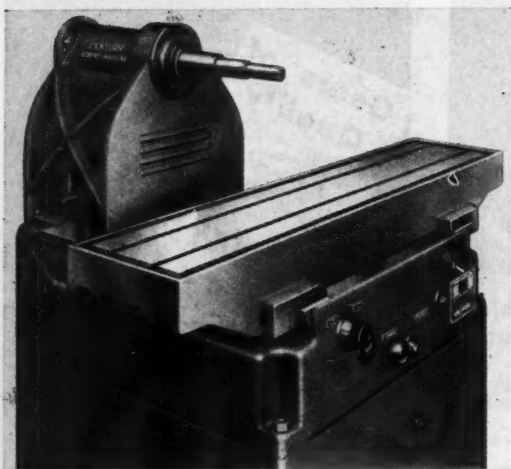
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State size and make of lathe.

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**PRECISION
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PRODUCTS**



Century Model RC Precision Boring Machine

Century Model RC Precision Boring Machine

The Century Model RC Precision Boring Machine shown herewith, product of the Century Engineering Co., Inc., 5529

S. Vermont Ave., Los Angeles 37, Cal., is specially designed to finish bore holes up to approximately 2½ inches in diameter and is said to lend itself to special applications and setups.

The table is provided with a working surface of 6¼ x 33½ inches and moves on dovetail ways of generous proportions on which heavy fixtures can be easily handled. The table has two 1½-inch wide T-slots, running the full length and a coolant trough around the outside edge. The ways are provided with an automatic oiling system.

The center line of the spindle is 6½ inches above the table. The spindle housing is of rugged construction to assure freedom from deflection and vibration. The spindle is mounted on four preloaded precision ball bearings and has a No. 5 Morse taper. A three-step pulley provides for operation of the spindle at 650, 1,300, and 2,600

rpm.

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Motorized
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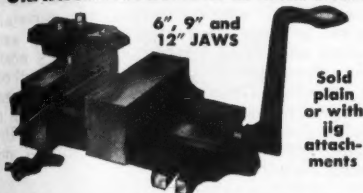
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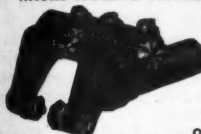
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With its many special jaws, drill guides, stops, etc., etc., this vise is always widely useful, whether under wartime or peacetime conditions, as a jig or fixture for drill press, planer, shaper, radial, miller, grinder. Sizes from 124 lbs.

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KNURL HOLDER FITTING LATHE TURRET



Its "Adjust-angle" feature enables you to produce many patterns of straight, spiral and checkered knurlings using only straight knurls.

Handles work up to 2 1/2" diameter.

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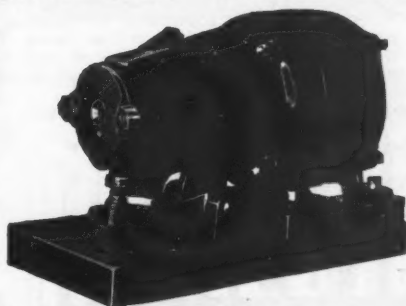
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That's what the PRECISION WIRE STRIPPER is doing today for hundreds of war production plants throughout the U. S.—AND IT WILL DO THE SAME THING FOR YOU if wire stripping problems now confront you.

In a twinkling, this ruggedly built precision instrument removes insulation from the ends of solid, stranded or multi-conductor cable and wire up to a half inch in diameter AND IT DOESN'T REQUIRE A SKILLED OPERATOR.



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r. p. m. when using 60 cycle current. The $\frac{1}{2}$ h. p. 110-volt motor used to power the spindle is mounted on a hinged plate which maintains proper tension on V-belt and simplifies belt shifting.

The air-hydraulic feed mechanism of the Century Model RC Precision Boring Machine is of simple design and trouble-free in operation, it is claimed. All controls are conveniently located on the front of the machine. Boring feeds are variable through a wide range and are accurately controlled by a metering valve of unique design. A second metering valve can be supplied to control the return movement of the table so that the forward stroke can be used for a semi-finish cut and the return stroke for finishing. The feed mechanism operates on 90 to 125 lb. of air.

The base of the machine is supported at three points and may be mounted on a bench or a floor stand which is available as optional equipment. The floor stand provides a convenient enclosure for self-contained coolant system, also available as optional equipment.

The Century Model RC Precision Boring Machine can also be arranged with an additional slide for the table which

allows for cross movement as well as longitudinal movement of the table. The slide, which moves on dovetail ways, is hand operated by a rack and pinion and may be locked in any position, thus affording a convenient method of moving from one hole to another. The slide may also be equipped with a dial indicator and V-blocks so that the table can be accurately indexed by using space bars.

Kollman "Rapid-Stamp"

Known as the Kollman "Rapid-Stamp," a device for die stamping numbers and other required information on small parts for aircraft, guns, and so on, is now being marketed by the James H. Cross Co., 2765 W. 8th St., Erie, Pa. Of simple design, the device measures only $10\frac{1}{4}$ inches long from the end of the shank to the bottom of the stamp die holder.

Easy to use, the Kollman Rapid-Stamp is said to be most efficient when operated in a drill press. The sleeve at the top of the tool body encloses an impact spring which is adjustable

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and any seed for healthy post-war growth must include the new elements that contributed so much to victory.

OH-38 Aluminum Alloy—an exclusive Hedstrom product—has proven its superiority in hundreds of war products and permissible civilian items. You will want it for the component parts of your new and improved products—for parts that can be made better, faster, cheaper—with OH-38.

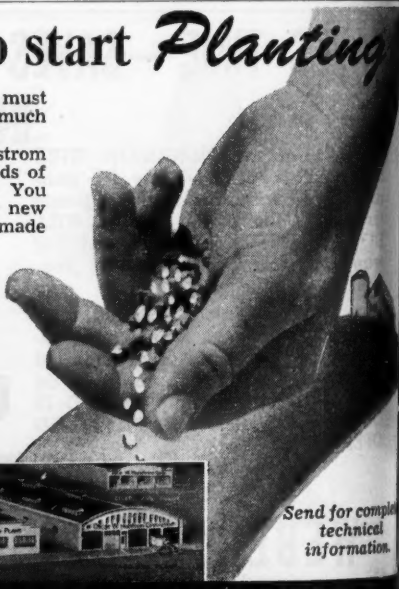
OH-38 is used only in castings by Hedstrom.

HEDSTROM



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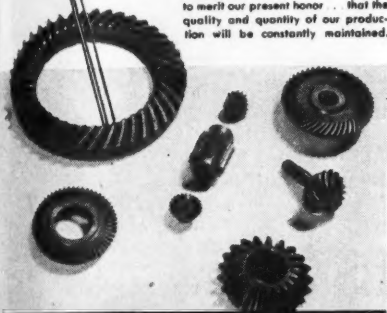


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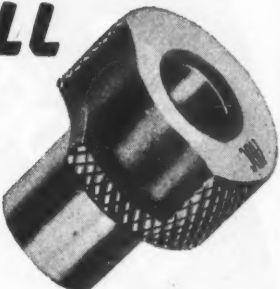
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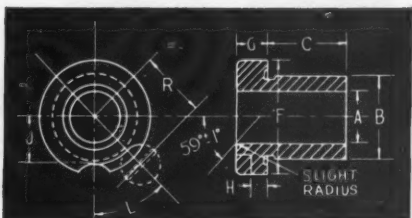
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for the exact impact desired for the metal to be stamped. A simple clockwise turn of the sleeve increases the impact while a counterclockwise turn decreases it. A lock ring maintains the setting.

The trip and release mechanism of

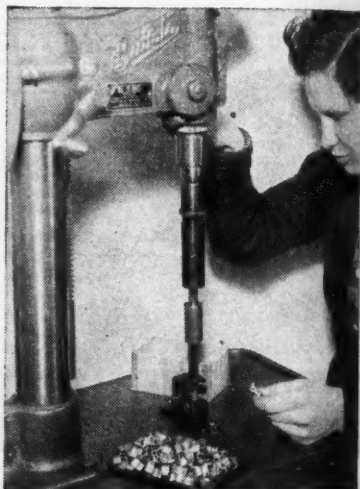


Illustration showing Kollman "Rapid-Stamp" installed on drill press

the Rapid-Stamp operates the die in much the same way that the firing pin of an automatic weapon detonates the cartridge. Practically any ordinary stamp die can be fitted in the holder of the Rapid-Stamp, four set screws being provided to hold the die in position.

The accompanying illustration shows the Kollman Rapid-Stamp inserted in a

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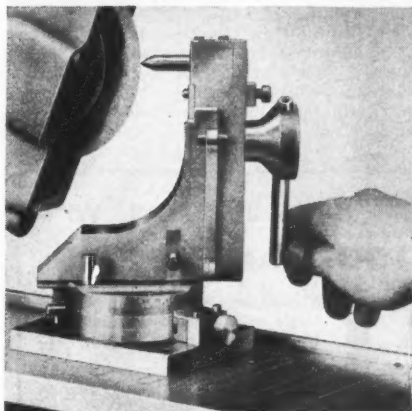
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Large range yet compact
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-NO BREAKING**

Saves Blades . . . Increases Production . . .

Cutting speed is gained by pushing against the saw blade. **PADDOCK BALL-BEARING BAND SAW GUIDES** enable workers to crowd work through . . . practically double efficiency of any band saw. Every point of support is a ball-bearing wheel running in same direction with saw. **PADDOCKS** are recommended for use in cutting all kinds of material. Remember—guide wheels are interchangeable (you can balance wear by switching wheels). Write for full details and prices.

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BAND SAW GUIDES

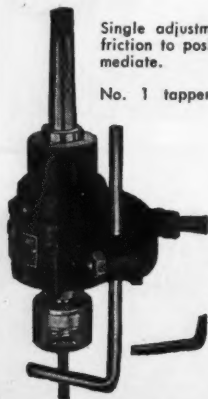
Guided and Guarded by 6 Safety Points

MODEL
No. 6



$\frac{1}{2}$ -inch chuck on a drill press. A part-holding fixture designed by the user is clamped to the press table. This fixture supports the part and holds it in predetermined position. A partial housing for the specific die shaft used should be incorporated in the holding fixture to hold the stamp die shaft in perfect alignment and prevent it from turning. In operating the Rapid-Stamp all belting or other power take-off is removed from the machine temporarily. One stroke of the operating lever or pedal is said to be sufficient for producing the desired marking on part.

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Single adjustment changes from light friction to positive drive or any intermediate.

No. 1 tapper, friction or positive, drives 2-56 to $\frac{3}{8}$ " tap in steel or any other material.

No. 2 positive tapper drives $\frac{3}{8}$ " to $\frac{1}{2}$ " tap in steel or any other material.

No. 3 drives $\frac{1}{2}$ " to 1" in steel or any other material.

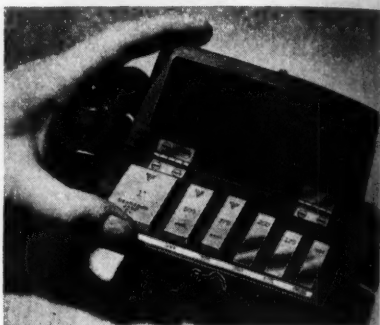
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A personalized set of chromium plated gage blocks for toolmakers desiring their own individual set of standards for



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Matthews "Lo-Stress" Marking Tools

Especially made for marking parts placed under torsion, tension, or bending, or any combination of these, or where heat treating is accomplished by cracking or breaking due to stress concentration, a line of marking tools have



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Any size hole within a 1" range of infinite variation! That's what one size Champion Expanding Mandrel will completely and accurately handle. The hardened steel flexible sleeve automatically expands to the correct size as it is raised on the tapered arbor. Only 12 champions needed for range from $\frac{1}{2}$ " to 6 $\frac{1}{2}$ ". Eliminates numerous solid mandrel sizes. More convenient. Costs $\frac{1}{2}$ less. Proved for years by thousands of shops.

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*Use Them
Over and Over*



DE-STA-CO ARBOR SPACERS

Measured by the number of times De-Sta-Co Spacers can be used, they are the lowest in cost of any spacers you can buy.

Made of metal, they are not affected by oil or heat.

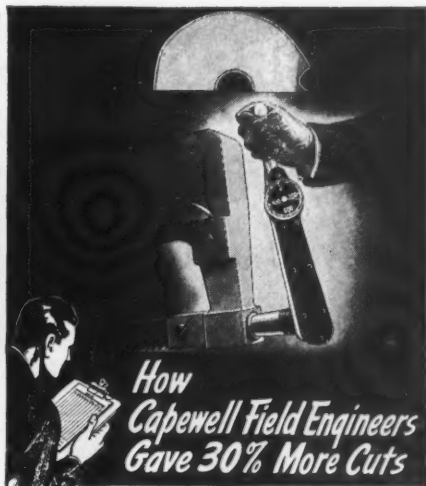
Use for quick set-up of milling machine cutters and wherever low cost, accurate spacing is needed. Stock sizes .001" to .125" thick. Specials, any length, cut from bar stock, ground to decimal.

TRIAL ASSORTMENT—enough for average use on one machine sent for \$1.00. Give arbor size.

Size and price list sent FREE!

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Established Over 25 Years
349 Midland Ave. • Detroit 3, Mich.

September, 1944



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His Analysis Covers:—

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2. STUDY OF MATERIAL
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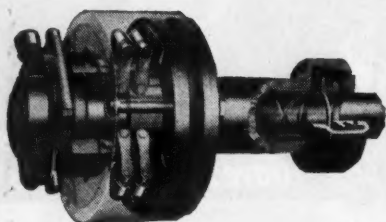


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drive your productive machinery by the powerful, persistent torque developed by MULE-PULL CLUTCHES . . . it saves time and boosts production by the smooth and instant acceleration it gives. The Loose Sleeves of these Clutches have RING - OILING lubrication which prevents ground-out bearings and avoids costly repairs. The single-arm, anti-friction ROLLER TOGGLES which actuate these Clutches give high horse - power capacity; require no lubrication; are free from repairs even under constant in-and-out engagement.

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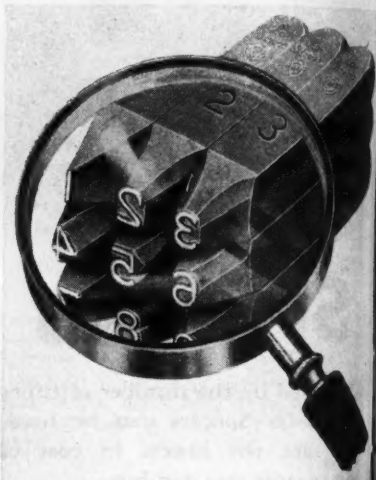


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CLUTCHES**

BROWN ENGINEERING CO.
120 N. THIRD ST. READING, PA.

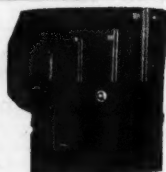
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operated presses; roller dies for use in all types of marking machines and steel type for use in type holders. Tools are so designed that they can be supplied for any desired marking depth to suit the stamping application.



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WIGGLER \$1.25

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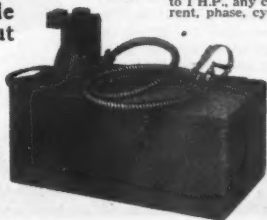


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Standard "Air-Rester" Dust Collector

A compact self-contained dust collector for use in conjunction with all types of grinding, buffing, and polishing equipment, to be known as the "Air-Rester," is now being offered by The Standard Electrical Tool Co., 2487 River Rd., Cincinnati 4, Ohio.

A motor-driven fan is contained in the lower compartment of the unit while the upper dust collecting chamber is properly fitted with flameproof steel pads for filtering the air. By means of the Air-Rester, air is said to return to the room without perceptible dust, at low velocity, and without creating any objectionable draft or air movement.



Standard "Air-Rester" Dust Collector

ment. A convenient clean-out door provided in the unit for removing collected dust.

The Standard Air-Rester Dust Collector is available in four sizes with capacities of from 300 to 1,200 cubic feet per minute. The unit occupies a maximum floor space of 24 x 24 inches and is 47 inches high.

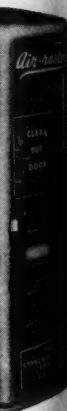
Florian Sine Angle Plate

The American Standard Co., Stonington, Conn., has placed on the market the Florian Sine Angle Plate.

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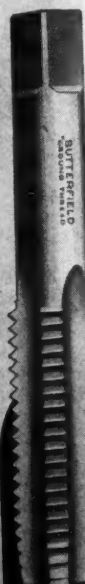
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September,



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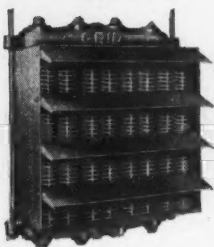
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being made of similar metals there is no
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pressures up to 250 lbs. In many plants
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Order from your dealer or write direct. Request literature. No obligation.

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Standard "Air-Rester" Dust Collector

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The Standard Air-Rester Dust Collector is available in four sizes with capacities of from 300 to 1,200 cubic feet per minute. The unit occupies a maximum floor space of 24 x 24 inches and is 47 inches high.

Florian Sine Angle Plate

The American Standard Co., South-
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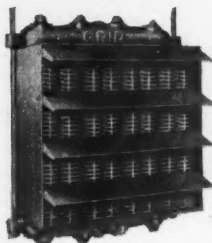
**ONE PIECE
CONSTRUCTION
"FIN"
SECTION**

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**GRID
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HEATERS**

**WILL LAST
LONGER THAN
OTHER TYPES
OF HEATING
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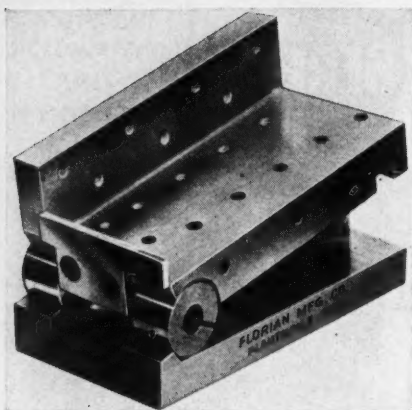


The condenser "fin" section (patented) is made in one piece of high test cast iron, the metal for permanency . . . no soldered, brazed, welded, or expanded connections . . .

nothing to become loose now or in future years of operation . . . nothing to develop leaks, breakdowns or heating failures, and being made of similar metals there is no electrolysis to cause corrosion. That's why GRID Unit Heaters outlast the other types of heating equipment — and without maintenance expense, and they can stand steam pressures up to 250 lbs. In many plants GRID Units have been operating continuously for over 10 years without maintenance expense (names upon request). They are built to last, so why install unit heaters that lose their efficiency after a short period of operation? Complete information and capacity tables upon request.

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Florian Sine Angle Plate

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New Books

Broaches and Broaching. Published by Broaching Tool Institute, 74 Trinity Place, New York 6, N. Y. 97 pages, 8 x 11 inches, 149 illustrations. Price, \$3.00.

In developing this book, the Broaching Tool Institute, a nation-wide organization of broaching tool manufacturers, has endeavored to bring to American industry a comprehensive discussion of broaching practice, to call attention to the very rapid recent progress in the broaching field, and to emphasize the application of broaching to both war and postwar production.

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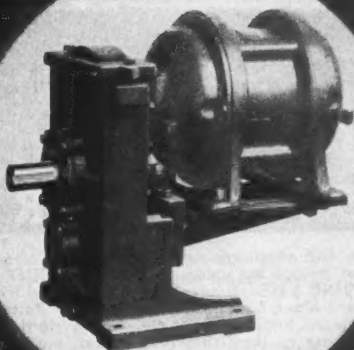
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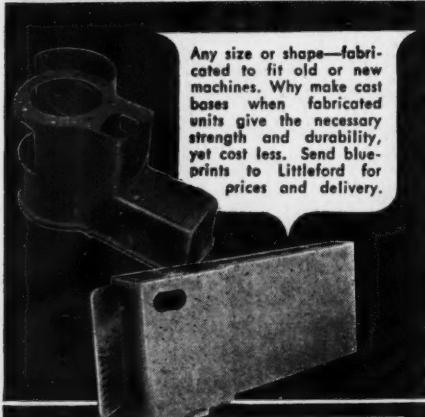
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sor such a volume since the purpose of the Institute is to compile standards, encourage research, and foster the progress of broaching for the benefit of the industry at large. The data which forms the basis of the book was chiefly contributed by the engineering staffs of the broach manufacturers who are members of the Institute. The principles outlined and the examples and practical applications cited are taken from the first-hand experience of highly qualified engineers in their daily contact with broaching problems.

Chapter headings of the book are as follows: History of Broaching; Advantages, Applications, Limitations of Broaching; Types of Broaches; Broach Cutting Action; Material to be Broached; Broach Design; Information Needed for Design and Manufacturing of Broaches; Broach Cost Factors; Handling Broaches; Sharpening Broaches; Broaching Machines; Setting Up the Broaching Machine; Fixtures; and Cutting Fluids.

Engineering Inspection Practice. By A.T. King. Published by Chemical Publishing Co., Inc., 26 Court St., Brooklyn, N. Y. 242 pages. 246 illustrations. Cloth binding, board covers. Price, \$3.00.

A complete guide to the methods, gages, and instruments used in engineering production workshops, this volume treats of the reading of working drawings, limits and tolerances, linear and angular measurement, the mathematics of measurement, measuring tools, the measuring of screw threads and gears, precision measuring engineering materials and hardening processes, testing of metals and hardness, aeronautical inspection, and so on. It is written in an unusually clear

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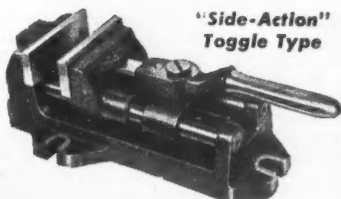
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For clamping parts of
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fashion and is said to be an excellent text upon which to base a course in inspection practice.

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Basic Airplane Mechanics. By H. G. Lesley. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York, 16, N. Y. 404 pages, 5½ x 8½ inches. Illustrated. Price, \$2.50.

Simply written and beautifully illustrated, this practical book covers the important facts and procedures which the airplane mechanic must know to keep planes in good working order. It deals with the theory of flight and the principles of airplane construction, and provides directions for the repair and maintenance of the various components

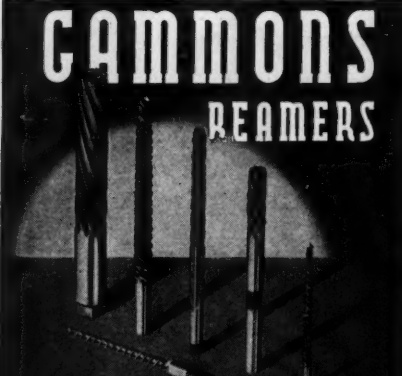
of the airplane. Materials used in the construction and repair of aircraft are fully described and analyzed.

"Basic Airplane Mechanics" is written in a direct, conversational style that is simple to understand, and is printed in large, easy-to-read type. It is illustrated with many perspective drawings, photographs, and cross-sectional drawings of parts, accessories, and components, all illustrations having full descriptive legends.

Contents of the book range as follows: Theory of Flight; Materials and Processes; Controls; Hydraulics; Electrical Circuits and Accessories; Aircraft Construction and Structural Repairs; Aircraft Welding; Deicing Equipment; Instruments; Fuel and Oil Systems; Heating Systems; Index.

The Craftsman Prepares to Teach. By David F. Jackey and Melvin L. Barlow. Published by The MacMillan Co., 60 Fifth Ave., New York, N. Y. 184 pages. Cloth binding, semi-flexible cover. Price, \$2.00.

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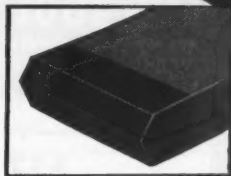
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dustry who have had little or no previous experience as teachers are being called upon today to train workers for many different industrial occupations. This book is written for their assistance. It explains how to plan and organize the subject matter to meet the desired objectives of a course and describes the basic techniques of successful teaching.

Six steps in the preparation of a course of study are given, with examples to illustrate each step. These steps are clearly explained, logical, and easy to apply to any subject matter.

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They show how to establish the objectives of a course, divide it into progressive lessons, organize the shop work and so on.

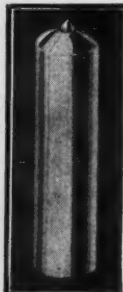
The fundamental teaching methods and the essentials of the psychology of learning are then explained. These include the skillful use of questions, demonstrations, recitation and discussion, experiment, shop work, and tests; methods of creating and holding interest; allowance for differences in the learning abilities of students; the use of available materials, such as models, charts, and so on, as teaching aids; the supervision of shop work; the preparation and grading of tests.

The book is simply written, brief, and to the point, and should prove an excellent guide for anyone preparing to teach industrial workers.

Trade Literature

"Incentives vs. Governmental Control" is the title of an address which was given before the Sales Executive Club of New York by James F. Lincoln, President, The Lincoln Electric Company, and which has been reprinted in the form of a 20-page pamphlet, 3 1/4 x 7 1/2 inches. Copies of pamphlet can be obtained free by writing to The Lincoln Electric Co., Cleveland 1, Ohio.

"Facts and Figures," an interesting 16-page booklet on high speed electric hand tools and their uses, is announced by the Precise Products Co., 1328 Clark St., Racine, Wis. The booklet includes a concise breakdown of the outstanding features of the Precise "35" (35,000 r.p.m.) electric hand tool, as well as descriptions of the various accessories mounted wheels, and midge milling cutters that are available with this tool. Copy free upon request.



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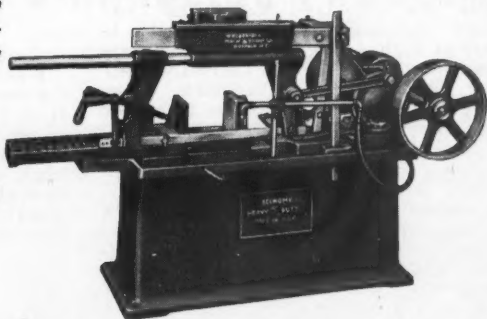
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The machine illustrated is the
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Cleveland Tapping Machine Folders. Two folders, one illustrating and describing the Cleveland Model D Precision Tapping Machine (capacity in steel at high speed, $\frac{1}{2}$ -inch N. C.) and another, the Cleveland Model DB Lead Screw Tapping Machine (capacity in steel at high speed, $1\frac{1}{4}$ -inch N. F.) are now being issued by the Cleveland Tapping Machine Co., Cleveland, Ohio. Copy of either or both folders free upon request.


"Stellite" Star J-Metal Cutting Tools. A 16-page pamphlet issued by the Haynes Stellite Co., Kokomo, Ind., lists sizes and prices of "Stellite" Star J-Metal standard square tool bits, standard rectangular tool bits, rounds, standard milling cutter blades, and standard welded tip tools. The pamphlet also contains illustrated, descriptive, and tabular information on holders and adapters for Star J-Metal tools and on Stellite wear strips. In addition, a list of recommended wheels for grinding Stellite Star J-Metal tools is provided in the pamphlet, copy of which is available free by requesting Form 2991.

Empire Live Center with replaceable point, product of King Products, 68 Spring St., New York 12, N. Y., is featured in a leaflet prepared by this firm. Copy free upon request.

Wales Type "E" Hole Punching Units for use on press brakes in punching extruded and shaped sections are fully covered as to features, applications, dimensions, prices, and so on, in a 12-page catalog published by the Wales-Strippit Co., 345 Payne Ave., North Tonawanda, N. Y. Copy of Catalog E free upon request.

Kling Rotary Shears. Designated as the No. 245, an eight-page bulletin descriptive of "Kling" Rotary Shears which are available in six sizes for cutting or forming straight lines, openings, circles, rings, reverse curves, odd shapes, strips, bevels, flanges, joggles, and offsets is now available free from Kling Bros. Engineering Works, 1306 N. Kostner Ave., Chicago 51, Illinois.

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A Free Wheeling Clutch of simple design recognized for many years as Standard Equipment for Automatic Dual Drive Operation—Automatic operation of 2 speed drive—As a ratchet permitting infinite adjustment and as an automatic backstop. Furnished in a number of types.

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MACWHYTE WIRE ROPE SLINGS

SOLVE INDUSTRY'S HANDLING PROBLEMS

Many different types, sizes, and kinds available

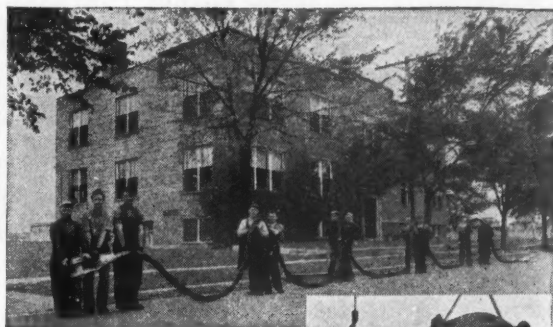
As early as 1912, Macwhyte engineers realized that the great strength and dependability of wire rope made it a perfect material for slings. Since that time they have learned through endless study and research how best to process wire rope into lightweight, easy-to-handle, safe-to-use slings.

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Whether you are lifting light or heavy loads, there is a Macwhyte sling to meet your requirements. You will receive prompt, practical cooperation and suggestions based on experience with hundreds of others doing jobs similar to yours.

Send for Macwhyte Sling Catalog S-7. A request on your company letterhead will bring it to you promptly, without obligation.



• (Above) An 80-foot long Macwhyte ATLAS Braided Sling for handling sunken barges.

(Right) A pair of Macwhyte ATLAS Braided Slings lifting a 125-ton oil refinery vessel.



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Left-&-Right Lay Braided Slings, Aircraft Cable,
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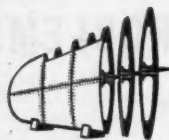
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"Lifting safety to new heights"

Macwhyte Wire Rope Slings are made to meet the capacity of any crane built.

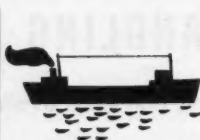
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DOYLE VACUUM CLEANER CO.

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346 MODERN MACHINE SHOP

Airco Machine Gas-Cutting Guide

Air Reduction, 60 E. 42nd St., New York 17, N. Y., is now offering a pocket-size slide-rule type guide which shows proper tip sizes, gas pressures, and other data required for cutting steel of various thicknesses with Airco "45" and "124" machine gas-cutting tips.

By setting the slide to one of the known factors, such as steel thickness, the gas-cutting machine operator can immediately determine the correct tip size to use, oxygen and acetylene pressures required, estimated gas consumption, width of kerf, and average cutting speed to be expected. The back of the guide lists helpful hints for machine gas cutting, including pointers on setting up, piercing starting holes, making heavy cuts, and so on.

Copy of Airco Machine Gas-Cutting Guide is available free upon receipt of a request on company letterhead.

"How to Measure in Micro Inches" is the title of a 20-page booklet published by Continental Machines, Inc., 1306 Washington Ave., So., Minneapolis 4, Minn. Inspectors, machinists and plant engineers should find this booklet of real value in demonstrating new uses for precision measuring instruments. It deals with the fundamentals of precision measurements, showing how these principles are applied to production in the daily control of product quality.

Dozens of photographs are used to show many new and highly useful applications for gage blocks, vernier gages, sine bars, master parallels, flats, and other precision measuring instruments. Charts and drawings illustrate the relationship of various dimensions as affected by the temperature of materials being measured.

In addition, the booklet points out how the Engineering Department and Production Department can work together in maintaining close dimensions in the fabrication of products. It shows various combinations of gage blocks and instruments used in measuring most any dimension. One section of the booklet is devoted to the care of these precision measuring instruments and the simple rules to follow in giving them long life. A number of new gaging instruments are introduced, and a brief description of the new mobile inspection unit is given. Copy of the booklet is available free upon request.

September, 1944

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To the Manufacturer Not Yet Using **Cold Treating** . . . Here's How Others are Getting the Advantages of Deepfreeze

Sub-Zero Temperatures

1 **TREATING** Tools and Machine Parts in a Deepfreeze Cascade -120° F. Industrial Chilling Machine.

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2 **SHRINK FITTING** all types of metal parts for rapid assembly in a Deepfreeze Cascade -120° F. Chilling Machine.



3 **STABILIZING** gauges and gauge blocks to within .000002" in a Deepfreeze -120° F. Chilling Machine.



4 **TESTING** of instruments and parts for use at extremely low temperatures in a Deepfreeze Model D-70 Industrial Chilling Machine.

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Division of Motor Products Corporation, Detroit, Michigan


"Out of Thin Air" is the title of an eight-page brochure prepared by The Dumore Co., Racine, Wis., telling of the strides made in the design of fractional horsepower motors since the beginning of the war. Illustrated in color, the brochure explains how the unique and exacting standards imposed upon motor manufacturers by the requirements of aircraft applications have telescoped years of normal development in motor design into a few months. Copy free upon request.

"Abrasive Milling" is the subject of a catalog announced by the Andrew C. Campbell Division, American Chain & Cable Co., Inc., Bridgeport 2, Conn. Included in the catalog are data covering features and specifications of the No. 302 Campbell Horizontal Wet Abrasive Cutting Machine. A typical application of this machine is illustrated and explained in detail. A special chart on the back page of the catalog outlines the standard models in the Campbell abrasive cutting line. Copy of catalog free upon request.

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Aluminum Imagineering Notebook. "Imagineering," as defined in this book, is the art of letting one's imagination soar and then engineering it down to earth. It is said to be a practical formula for disregarding old assumptions and inviting new suggestions on how things can be measurably improved.

As a stimulator of this mental process, the Aluminum Imagineering Notebook presents, first, twelve important economic advantages of aluminum and second, illustrates numerous examples of things which have been imagineered to aluminum actualities. Copies of this book are available by writing to the Aluminum Company of America, Pittsburgh, Pennsylvania.

Carboloy General Tool Catalog GT-175. A 30-page catalog which, in addition to an expanded line of standard tools available, features carbide form tools and "semi-standard" tools has been issued by the Carboloy Co., Inc., 11143 E. 8 Mile Ave., Detroit 32, Mich. Prices and specifications are also listed for such Carboloy products as masonry drills, diamond-impregnated grinding wheel dressers and center grinding cones, Brinell balls, twist drill tips, guide rings, and extruded rod.

Two pages are devoted to flat form, dovetail, skiving, circular, threading, radius forming, and other types of form tools. Typical semi-standard tools which can be made in a wide range of shapes and sizes to meet individual requirements are illustrated. The catalog also contains information on how to obtain fastest delivery of special tool and blanks and includes illustrations showing the wide range of Carboloy special blanks now available. Copy of Catalog GT-175 free upon request.



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